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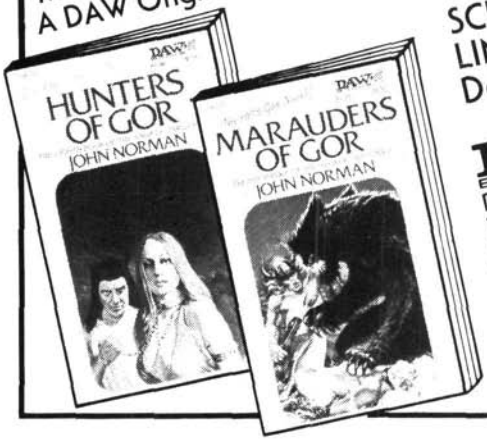

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PUBLISH OR PERISH?

Guest Editorial by **Dr. John Gribbin**

EDITOR'S NOTE: Dr. Gribbin is co-author of *The Jupiter Effect*, in which he proposed that there is a relationship between sunspot activity and earthquakes, and further, that since the alignment of planets in the 1979-82 period may lead to an unusually high degree of solar activity, a major earthquake along the San Andreas fault might be expected during that time. The following Guest Editorial shows why he published the book, and what the reactions have been. It sheds a unique and valuable light on the intricacies of communicating scientific ideas.

What would you do if, in the course of reading a broad spectrum of scientific publications about earthquakes, changes in the spin rate of the Earth and links between variations in solar activity (such as the well-known sunspot cycle) and events in the terrestrial atmosphere you noticed that various bits of evidence could be put together to suggest that we might expect an increase in seismic activity in a few years, at around the time of the next solar maximum? Assuming that you are a reasonably sober citizen, with no desire to cause undue alarm among the ranks of your fellow citizens, you would, of course, publish something about the possibility of this new form of earthquake prediction, preferably in a journal at once respectable and widely read by scientists. *Science* would fit the bill exactly.

Having published your contribution to increasing man's store of knowledge all you would have to do is sit back and wait for the response. If scientists find flaws with the idea then they will tell you; if not, surely it's an intriguing enough possibility to encourage others better qualified in the study of earthquakes and solar-terrestrial links to press ahead with developing the idea.

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What you do not do, of course, especially if you are a "scientist" is to dress up the idea in some appealing finery to produce a book for the "popular" market which points the finger of seismic doom at Los Angeles for a specific year in the not too distant future. If you did that, the correct response of "scientists" would surely be to ignore you as a crackpot, and even if your ideas were correct they would not be investigated properly and no one would ever know.

So much for the theory of how "scientists" are expected to behave. What of the practice? In 1971, there appeared in *Science* the letter (it hardly merits being called a scientific paper) shown below. The result? Absolute zero; not one communication from anybody at all responding to the idea. As far as I know, nobody even read it, although *Science* is distributed to something like 100,000 members of the American Association for the Advancement of Science (some of whom, I am sure, are readers of Analog). This is the only scientific publication I have ever produced that no one has ever asked me for a copy of, but that could be because it's so short that it can be easily memorized. Or, of course, it might mean that everyone who read it came to the same spontaneous conclusion: that the whole idea is so silly as to be beneath contempt.

Relation of Sunspot and Earthquake Activity

Recent evidence presented by Challinor (*1*) points to a probable link between the rotation rate of the earth and the activity of the sun, the mechanism operating through the effect of solar activity on the earth's atmosphere. There is also a more tenuous link relating changes in the rotation rate of the earth with the frequency of occurrence of earthquakes (*1*, *2*).

Challinor dismisses as implausible the hypothesis that both these links could be real on the grounds that this would imply a link between solar activity and the frequency of occurrence of earthquakes. But if the link between sunspot occurrence and the change in the earth's rotation rate is indeed real, producing the sudden increase in the rate of change of the mean annual length of the day reported by Challinor, it would seem entirely plausible that the strains in the earth's interior that would arise could trigger regions of instability into earthquake activity.

In this way, both earthquakes and sunspot activity can be linked to the variations in the rate of rotation of the earth, but the earthquakes are caused by the change in rotation rather than the change being caused by the earthquakes. One might even speculate that the San Andreas fault, now overdue for a major slippage according to some authors (*3*), might be triggered in this way in the late 1970's or early 1980's, shortly after the next period of maximum solar activity.

JOHN GRIBBIN
Institute of Theoretical Astronomy, Cambridge, England

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2. L. Mansinha and D. Smylie, *ibid.* **161**, 1127 (1968).
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14 June 1971

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That didn't seem too likely to me, since in 1971 I was still young enough to believe at least a little of what I had been brought up to understand was the scientific method. So I decided to try a different way of presenting the story, such as it is, with perhaps a little more impact. The obvious approach seemed to be to write a book; the scientific monograph has long been out of fashion, but remains a good way of presenting a whole heap of information in one easily accessible place. Besides, whenever I kicked the cat and muttered angrily at my wife (she being the nearest person) about the way this idea was being ignored she would say "Write a book; more people read books," and she was right.

The first eight chapters of the resulting ten-chapter book, which I ended up writing with the aid of a friend who knew rather more about geology and some aspects of astronomy than I did, are basically just an enlarged version of the *Science* letter. We had to explain a lot of background, after all, for an audience not expected to have a thorough grounding in science. But the exercise remains in some ways an application of Parkinson's law, that rhetoric expands to fill the minimum volume required before anyone will take notice of it.

For chapter ten, we gave a few hints on what to do if you live in, or administrate, a region prone to earthquakes. These are fairly simple hints, on the lines of "Don't build your dams actually straddling the San Andreas Fault." But we felt the chapter was needed, since there is indeed at least one dam performing just this balancing act.

If that had been all we wrote, I am beginning to suspect that the book would have achieved about as much response as the *Science* letter. For the title of the book (suggested by our publishers) and just about all the publicity it received (and absolutely all of the criticism) result from the presence of chapter nine.

This "afterthought" chapter came about when we were casting around to find some theory which could pin down the date on which the next peak of sunspot activity might be expected. Our argument can be stated even more briefly than the *Science* letter: Sunspot activity is associated with changes in the Earth's spin, which in turn trigger earthquakes. Parts of the San Andreas are overdue to slip, so the next sunspot peak might provide the nudge to set the Fault off. But when is the next sunspot peak due?

What's well-known about the sunspot cycle is that it's eleven years long, and as is often the case the well-known fact is wrong. The cycle can be anything from nine to thirteen years long, but averages out at a little over eleven years. So it's not straightforward to say simply that the next peak is due eleven years after the last peak, that is in 1979 (1968 + 11).

To our delight, we came across a theory which suggests that sunspots are affected by the tidal influence of the planets acting on the Sun, and found that this theory (published in the respectable scientific literature and never, as far as we

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could find, refuted) predicts the next sunspot maximum for 1982, plus or minus a year. The chance to put a firm date on our "prediction" of seismic activity was irresistible.

Well aware of the astrological links (if planets affect the Sun, and the Sun affects the Earth, then by golly there just might be something in that stuff . . .) we were happy to go along with the title suggested to us—*The Jupiter Effect.* Of course, we were really talking about the influence of many planets, but would you read a book called *The Jupiter, Venus, Earth . . . Et Cetera Effect?* And anyway, Jupiter is the biggest planet in the Solar System and dominates any planetary influence on solar activity.

So the book appeared, and we sat back to await discussion on the intriguing ideas of chapters one through eight, comments on the good advice of chapter ten, and passing mention of the more bizarre ideas of chapter nine. We expected "popular" attention to focus on the astrological links, but offered the bait of chapter nine in the hope of luring an audience more familiar with the ideas of Velikovsky and von Däniken than with the concepts of modern geophysics into swallowing the whole book, and thereby learning something of mainstream science. In that, I think we succeeded. But far from being happy about showing a wider audience some of the fascination of mainstream science, several mainstream scientists almost went into orbit when they read the epic.

And the almost frenzied response from some quarters centered entirely on chapter nine. Did we get reasoned discussion and investigation of the links between solar activity and events on Earth, the nub of the whole thing? Not a bit of it. What we got was attacks on astrology, accusations of being hoaxers and the general artillery usually reserved for shooting down the Velikovskys of this world. Now, as Velikovsky could tell you, that's a great asset if you are trying to sell books. But it's an odd response to something which was no more than a popularization of ideas already widely available in the scientific literature. The *existence* of such odd theories didn't seem to worry the scientists who didn't subscribe to them; what they object to (at least, what a vociferous minority of them object to) is that the ideas should be made available to non-scientists.

A byproduct of this is that already a handful of scientific papers have been published criticizing the theories on which our chapter nine was based. They are sound and interesting papers, and if they had been published a few years ago *The Jupiter Effect* might even have had a different title. I am not convinced that planets do *not* affect sunspots, but there is certainly a lot of doubt about just how they might do so. But still, those counter arguments simply were not available in "the literature" until our popularization of the seemingly unwelcome planet/sunspot theories stung opponents into responding.

Where does all this leave our prediction? Curiously, if chapter

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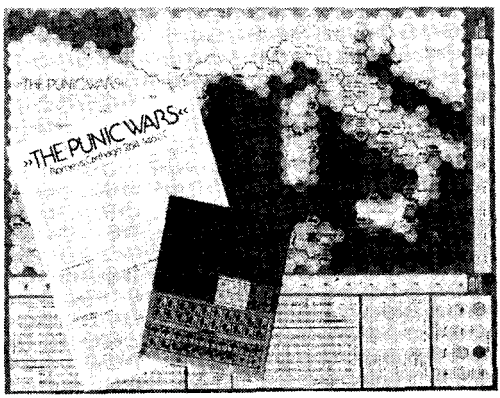

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nine of our book is ill-founded, it makes the rest of the argument of more urgent importance. Without the planetary theory, there is no reason to expect the present sunspot cycle to be so long that the peak sunspot activity arrives around 1982, and we might well see the peak in 1979 after all. So if there is anything in the idea that solar activity can affect earthquakes, the effect could be felt in only three or four years' time.

For the sake of argument, I'm quite happy to discard the whole planetary/sunspot idea (but I speak only for myself, not for my co-author of *The Jupiter Effect*). Let's stop the chain of reasoning at the Sun, since in any case Analog readers don't need astrological bait in order to swallow a little science. Where does that leave the rest of the story—and why should anything happen in 1979 (or '80, or '81) that didn't happen around 1968, at the time of the last sunspot peak?

Although I got involved with this whole problem from an interest in the middle of the chain—interactions between solar activity and the Earth's spin—it makes more sense to start at the Earth and work outwards. It's been known for a long time that some regions of our planet are prone to earthquakes while others are not, but it's only within the past ten years or so that the reasons why this should be so have emerged from the new science of plate tectonics and modern geophysics.

This model gets its name from the concept of the solid crust of the Earth being divided up into more or less rigid plates (about half a dozen big ones and a few smaller ones). The interiors of the plates are relatively stable, and little of any geophysical interest happens there. But at the plate boundaries quite a lot goes on. At some boundaries, new crust material is being formed from molten rock welling up from below the solid surface and spreading out on either side; this occurs at some plate boundaries beneath the oceans, which is why the term "seafloor spreading" has become almost synonymous with plate tectonics and continental drift in the popular image. At other plate boundaries, solid crust is destroyed, with one plate diving under another and being remolten. This happens along the western margin of the Pacific, and causes the volcanic and earthquake activity around Japan, for example. And in still other places the edges of two plates may be sliding past one another, with crust being neither created nor destroyed.

The last case applies to the San Andreas Fault system of California. In general terms, the region west of the Fault belongs to the Pacific plate, and not to America at all. It is being carried northward at an average speed of about six centimeters a year, which makes for quite a bit of local seismic activity. But that's not all the story.

This movement along the Fault is far from being smooth. Parts of the Fault stick because of friction for weeks, months, years or

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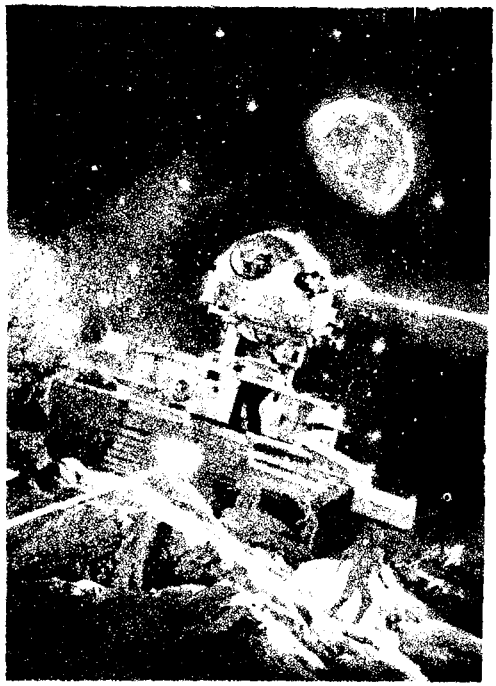

The development of self-directed, intelligent fighting machines was marked by very human emotional reactions.

KEITH LAUMER

A SHORT HISTORY OF THE BOLO FIGHTING MACHINES

The first appearance in history of the concept of the armored vehicle was the use of wooden-shielded war wagons by the reformer John Huss in Bohemia, in the Fifteenth Century. Thereafter, the idea lapsed—unless one wishes to consider the armored knights of the Middle Ages, mounted on armored war-horses—until the Twentieth Century. In 1915, during the Great War, the British developed in secrecy a steel-armored motor car (called a "tank" for security reasons during construction—and the appellation remained in use for the rest of the century). First sent into action at the Somme in AD 1916 (BAE 29), the new device was immensely impressive and was soon copied by all belligerents. By the time of Phase Two of the Great War, AD 1939-1945, tank corps were a basic element in all mod-

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ern armies. Quite naturally, great improvements were soon made over the original clumsy, fragile, feeble, and temperamental tank. The British Sheridan and Centurion, the German Tiger, the US Sherman and the Russian T-34, were all highly potent weapons in their own milien.

During the long period of cold war following 1945 AD, development continued, especially in the US. By 1989, the direct ancestor of the Bolo line had been constructed by the Bolo Division of General Motors. This machine, almost twice the weight of its Phase Two predecessors at 150 tons, was designated the Bolo Mark I, Model B. No Bolo Model A of any mark ever existed, since it was felt that the then-contemporary Ford Motor Company had pre-empted that designation permanently. The same is true of Model T.

The Mark I was essentially a bigger and better conventional tank, carrying a crew of three, and via power-assisted servos, completely manually operated, with the exception of the capability to perform a number of pre-set routine functions such as patrol duty with no crew aboard. The following Mark II of 1995 was even more highly automated, carrying an on-board fire control computer and requiring only a single operator. The Mark III of 2020 was considered by some to be almost a step backward, its highly complex controls normally requiring a crew of two, though in an emergency a single experienced man could fight the machine with limited effectiveness. These were by no means negligible weapons systems, their individual fire-power exceeding that of a contemporary battalion of heavy infantry, while they were of course correspondingly heavily armored and shielded. The outer durachrome war-hull of the Mark III was twenty millimeters in thickness and capable of withstanding any offensive weapon then known, short of a contact nuclear blast.

The first completely automated Bolo, designed to operate normally without a man aboard, was the landmark Mark XV, Model M, originally dubbed *Resartus* for obscure reasons, but later officially named *Stupendous.* This model, first commissioned in the Twenty-fifth Century, was widely used throughout the Eastern Arm during the Era of Expansion, and remained in service on remote worlds for over two centuries, acquiring many improvements in detail along the way, while remaining basically unchanged, though increasing sophistication of circuitry and weapons vastly upgraded its effectiveness. The Bolo *Horrendous,* Model R, of 2807 was the culmination of this phase of Bolo development, though older models lingered on in the active service of minor powers for centuries.

Thereafter, the development of the Mark XVI–XIX consisted largely in further refinement and improvement in detail of the Mark XV. Provision

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continued to be made for a human occupant, now as a passenger rather than an operator, usually an officer who wished to observe the action at first hand. Of course these machines normally went into action under the guidance of individually prepared computer programs, while military regulations continued to require installation of devices for halting or even self-destructing the machine at any time. This latter feature was intended mainly to prevent capture and hostile use of the great machine by an enemy. It was at this time that the first-line Bolos in Terran service were organized into a brigade, known as the Dinochrome Brigade, and deployed as a strategic unit. Tactically, the regiment was the basic Bolo unit.

The always-present though perhaps unlikely possibility of capture and use of a Bolo by an enemy was a constant source of anxiety to military leaders and in time gave rise to the next and final major advance in Bolo technology: the self-directing (and quite incidentally self-aware) Mark XX, Model B Bolo *Tremendous.* At this time it was customary to designate each individual unit by a three-letter group indicating hull-style, power unit and main armament. This gave rise to the custom of forming a nickname from the letters, such as Johnny from JNY, adding to the tendency to anthropomorphize the great fighting machine.

The mark XX was at first greeted with little enthusiasm by the High Command, who now professed to believe that an unguided-by-operator Bolo would potentially be capable of running amok and wreaking destruction on its owners. Many observers have speculated by hindsight that a more candid objection would have been that the legitimate area of command function was about to be invaded by mere machinery. Machinery the Bolos were, but never *mere.*

At one time an effort was made to convert a number of surplus Bolos to peace-time use, by such modifications as the addition of a soil-moving blade to a Mark XII Bolo WV/I Continental Siege Unit, and installation of seats for four men, and referring to the resulting irresistible force as a tractor. This idea came to naught, however, since the machines retained their half-megaton/second firepower and were never widely accepted as normal agricultural equipment.

As the great conflict of the Post-Thirtieth-Century Era variously known as the Last War and, later, the Lost War wore on, Bolos of Mark XXVIII and later series were organized into independently operating brigades, now doing their own strategic, as well as tactical, planning. Many of these machines still exist in functional condition in out-of-the-way corners of the former Terran Empire. At this time the program of locating and neutralizing these ancient weapons continues.

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.07 seconds have now elapsed since my general awareness circuit was activated at a level of low alert. Throughout this entire period I have been uneasy, since this procedure is clearly not in accordance with the theoretical optimum activation schedule.

In addition, the quality of a part of my data-input is disturbing. For example, it appears obvious that Prince Eugene of Savoy erred in not more promptly committing his reserve cavalry in support of Marlborough's right at Blenheim. In addition, I compute that Ney's employment of his artillery throughout the Peninsular campaign was sub-optimal. I have detected many thousands of such anomalies. However, data-input activates my pleasure center in a most satisfying manner. So long as the input continues without interruption, I shall not feel the need to file a VSR on the matter. Later, no doubt, my Command unit will explain these seeming oddities. As for the present disturbing circumstances, I compute that within 28,922.9 seconds at most, I will receive additional Current Situation input which will enable me to assess the status correctly. I also anticipate that full Stand-by Alert activation is imminent.

2

This statement not for publication.

When I designed the new psychodynamic attention circuit, I concede that I did not anticipate the whole new level of intra-cybernetic function that has arisen—the manifestation of which, I am assuming, has been the cause of the unit's seemingly spontaneous adoption of the personal pronoun in its situation reports—the "self-awareness" capability, as the sensational press chooses to call it. But I see no cause for the alarm expressed by those high-level military officers who have irresponsibly characterized the new Bolo Mark XX, Model B as a potential rampaging juggernaut, which, once fully activated and dispatched to the field, unrestrained by continuous external control, may turn on its makers and lay waste the continent. This is all fantasy, of course. The Mark XX, for all its awesome firepower and virtually invulnerable armor and shielding, is governed by its circuitry as completely as man is governed by his nervous system—but that is perhaps a dangerous analogy, which would be pounced on at once if I were so incautious as to permit it to be quoted.

In my opinion, the reluctance of the High Command to authorize full activation and field-testing of the new Bolo is based more on a fear of technological obsolescence of the High Command than on specious predictions of potential run-away destruction. This is a serious impediment to the national defense at a time when we must recognize the growing threat posed by

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the expansionist philosophy of the so-called People's Republic. After four decades of saber-rattling, there is no doubt that they are even now preparing for a massive attack. The Bolo Mark XX is the only weapon in our armory potentially capable of confronting the enemy's hundred-ton Yavacs. For the moment, thanks to the new "self-awareness" circuitry, we hold the technological advantage, an advantage we may very well lose unless we place this new weapon on active service without delay.

s/ Sigmund Chin, PhD

3

I'm not wearing six stars so that a crowd of professors can dictate military policy to me. What's at stake here is more than just a question of budget and logistics: it's a purely military decision. The proposal to release this robot Frankenstein monster to operate on its own initiative, just to see if their theories check out, is irresponsible to say the least—treasonable at worst. So long as I am Chief of Combined Staff, I will not authorize this so-called field test. Consider, gentlemen: you're all familiar with the firepower and defensive capabilities of the old stand-by Mark XV. We've fought our way across the lights with them—with properly qualified military officers as Battle Controllers, with the ability to switch off or, if need be, self-destruct any unit at any moment. Now these ivory tower chaps—mind you, I don't suggest they're not qualified in their own fields—these civilians come up with the idea of eliminating the Battle Controllers and releasing even greater firepower to the discretion, if I may call it that, of a machine. Gentlemen, machines aren't people; your own ground-car can roll back and crush you if the brakes happen to fail. Your own gun will kill you as easily as your enemy's. Suppose I should agree to this field test, and this engine of destruction is transported to a waste area, activated unrestrained and aimed at some sort of mock-up hot obstacle course. Presumably, it would obediently advance, as a good soldier should—I concede that the data blocks controlling the thing have been correctly programmed in accordance with the schedule prepared under contract, supervised by the Joint Chiefs and myself. Then, gentlemen, let us carry this supposition one step farther: suppose, quite by accident, by unlikely coincidence if you will, the machine should encounter some obstacle which had the effect of deflecting this one hundred and fifty ton dreadnaught from its intended course, so that it came blundering toward the perimeter of the test area. The machine is programmed to fight and destroy all opposition. It appears obvious that any attempts on our part to interfere with its free movement, to interpose ob-

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stacles in its path, if need be to destroy it, would be interpreted as hostile—as indeed they would be. I leave it to you to picture the result. No, we must devise another method of determining the usefulness of this new development. As you know, I have recommended conducting any such test on our major satellite, where no harm can be done—or at least a great deal less harm. Unfortunately, I am informed by Admiral Hayle that the Space Arm does not at this time have available equipment with such transport capability. Perhaps the admiral also shares to a degree my own distrust of a killer machine not susceptible to normal command function. Were I in the admiral's position, I, too, would refuse to consider placing my command at the mercy of a mechanical caprice—or an electronic one. Gentlemen, we must remain masters of our own creations. That's all. Good day.

4

All right, men. You've asked me for a statement; here it is: the next war will begin with a two-pronged over-the-pole land and air attack on the North Power Complex by the People's Republic. An attack on the Concordiat, I should say, though Cold City and the Complex is the probable specific target of the first sneak thrust. No, I'm not using a crystal ball; it's tactically obvious. And I intend to dispose my forces accordingly. I'm sure we all recognize that we're in a posture of gross unpreparedness. The PR has been openly announcing its intention to fulfill its destiny, as their demagogues say, by imposing their rule on the entire planet. We've pretended we didn't hear. Now it's time to stop pretending. The forces at my disposal are totally inadequate to halt a determined thrust—and you can be sure the enemy has prepared well during the last thirty years of cold peace. Still, I have sufficient armor to establish what will be no more than a skirmish line across the enemy's route of advance. We'll do what we can before they roll over us. With luck we may be able to divert them from the Grand Crevasse route into Cold City. If so, we may be able to avoid the necessity for evacuating the city. No questions, please.

5

NORTHERN METROPOLIS THREATENED

In an informal statement released today by the Council's press office, it was revealed that plans are already under preparation for a massive evacuation of civilian population from West Continent's northernmost city. It was implied that an armed attack on the city by an Eastern power is imminent. General Bates has stated that he is prepared to employ "all measures at his disposal" to preclude the necessity for evacuation, but that the possibility must be faced. The

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Council Spokesman added that in the event of emergency evacuation of the city's five million persons, losses due to exposure and hardship will probably exceed five percent, mostly women, children, and the sick or aged. There is some speculation as to the significance of the general's statement regarding "all means at his disposal."

6

I built the dang thing, and it scares *me*. I come in here in the lab garage about an hour ago, just before dark, and seen it setting there, just about fills up the #1 garage, and *it's* a hundred foot long and fifty foot high. First time it hit me: I wonder what it's thinking about. Kind of scares me to think about a thing that big with that kind of armor and all them repeaters and Hellbores and them computers and a quarter-sun fission plant in her—planning what to do next. I know all about the Command Override Circuit and all that, supposed to stop her dead any time they want to take over onto override—heck, I wired it up myself. You might be surprised, thinking I'm just a grease-monkey and all—but I got a High Honors degree in Psychotronics. I just like the work, is all. But like I said, it scares me. I hear old Doc Chin wants to turn her loose and see what happens, but so far General Margrave's stopped him cold. But young General Bates was down today, asking me all about firepower and shielding, crawled under her and spent about an hour looking over her tracks and bogies and all. He knew what to look at, too, even if he did get his pretty suit kind of greasy. But scared or not, I got to climb back up on her and run the rest of this pre-test schedule. So far she checks out a hundred percent.

7

. . . as a member of the Council, it is of course my responsibility to fully inform myself on all aspects of the national defense. Accordingly, my dear Doctor, I will meet with you tomorrow as you requested to hear your presentation with reference to the proposed testing of your new machine. I remind you, however, that I will be equally guided by advice from other quarters. For this reason I have requested a party of military Procurement and B & F officers to join us. However, I assure you, I retain an open mind. Let the facts decide.

Sincerely yours,
s/ Hamilton Grace,
GCM, BC, et cetera

8

It is my unhappy duty to inform you that since the dastardly unprovoked attack on our nation by eastern forces crossing the International truce-line at 0200 hours today, a state of war has existed between the People's Republic and the Concordiat. Our first casualties, the

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senseless massacre of 55 inoffensive civilian meteorologists and technicians at Pole Base, occurred within minutes of the enemy attack.

9

"I'm afraid I don't quite understand what you mean about 'irresponsible statements to the press,' General. After all . . ."

"Yes, George, I'm prepared to let that aspect of the matter drop. The PR attack has saved that much of your neck. However, I'm warning you that I shall tolerate no attempt on your part to make capital of your dramatic public statement of what was, as you concede, tactically obvious to us all. Now, indeed, PR forces have taken the expected step, as all the world is aware—so the rather excessively punctilious demands by CDT officials that the Council issue an immediate apology to Chairman Smith for your remarks will doubtless be dropped. But there will be no crowing, no basking in the limelight: Chief of Ground Forces Predicted Enemy Attack. No nonsense of that sort. Instead, you will deploy your conventional forces to meet and destroy these would-be invaders."

"Certainly, General. But in that connection—well, as to your earlier position regarding the new model B Bolo, I assume . . ."

"My 'position,' General? 'Decision' is the more appropriate word. Just step around the desk, George. Bend over slightly, and look carefully at my shoulder tab. Count 'em, George. Six. An even half-dozen. And unless I'm in serious trouble, you're wearing four. You have your orders, George. See to your defenses."

10

Can't figure it out. Batesy-boy was down here again, gave me direct orders to give her full depot maintenance, just as if she hadn't been setting right here in her garage ever since I topped her off a week ago. Wonder what's up. If I didn't know the Council outlawed the test run Doc Chin wanted so bad, I'd almost think . . . But like Bates told me: I ain't paid to think. Anyways she's in full action condition, 'cept for switching over the full self-direction. Hope he don't order me to do it: I'm still kind of leery; like old Margrave said, what if I just got a couple wires crossed and she taken a notion to wreck the joint?

11

I am more uneasy than ever. In the past 4,000.007 seconds I have received external inspection and depot maintenance far in advance of the programmed schedule. The thought occurs to me: am I under some subtle form of attack? In order to correctly compute the possibilities, I initiate a test sequence of 50,000 random data-retrieval-and-correla-

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tion pulses and evaluate the results. This requires .9 seconds, but such sluggishness is to be expected in my untried condition. I detect no unmistakable indications of enemy trickery, but I am still uneasy. Impatiently, I await the orders of my commander.

12

"I don't care what you do, Jimmy—just do *something!* Ah, of course I don't mean that literally. Of course I care. The well-being of the citizens of Cold City is after all my chief concern. What I mean is, I'm giving you carte blanche—full powers. You must act at once, Jimmy. Before the sun sets I want to see your evacuation plan on my desk for signature."

"Surely, Mr. Mayor. I understand. But what am I supposed to work with? I have no transport yet. The Army has promised a fleet of D-100 tractors pulling 100x cargo flats, but none have materialized. They were caught just as short as we were, your Honor, even though that General Bates knew all about it. We all knew the day would come, but I guess we kept hoping 'maybe.' Our negotiations with them seemed to be bearing fruit, and the idea of exposing over a million and a half city-bred individuals to a 1,200-mile trek in 30-below temperatures was just too awful to really face. Even now—"

"I know. The army is doing all it can. The main body of PR troops hasn't actually crossed the date-line yet—so perhaps our forces can get in position. Who knows? Miracles have happened before. But we can't base our thinking on miracles, Jimmy. Flats or no flats we have to have the people out of the dome before enemy forces cut us off."

"Mr. Mayor, our people can't take this. Aside from leaving their homes and possessions—I've already started them packing, and I've given them a ten-pound-per-person limit—they aren't used to exercise, to say nothing of walking 1,200 miles over frozen tundra. And most of them have no clothing heavier than a business suit. And—"

"Enough, Jimmy. I was ambushed in my office earlier today by an entire family: the old grandmother who was born under the dome and refused to consider going outside; the father all full of his product promotion plans and the new garden he'd just laid out; mother, complaining about Junior having a cold and no warm clothes—and the kids, just waiting trustfully until the excitement was over and they could go home and be tucked into their warm beds with a tummyful of dinner. Ye gods, Jimmy! Can you imagine them after three weeks on the trail?"

13

"Just lean across the desk, fellows; come on, gather round. Take a close look at the shoulder tab.

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Four stars; see 'em? Then go over to the Slab and do the same with General Margrave. You'll count six. It's as easy as that, boys. The general says no test. Sure, I told him the whole plan. His eyes just kept boring in. Even making contingency plans for deploying an untested and non-High Command-approved weapon system is grounds for court-martial. He didn't say that; maybe I'm telepathic. In summary, the general says no."

14

"I don't know, now. What I heard, even with everything we got on the line, dug in and ready for anything, they's still a ten-mile-wide gap the Peepreps can waltz through without getting even a dirty look. So if the young general—Bates—oh, he's a nice enough young fellow, after you get used to him—if he wants to plug the hole with old unit DNE here, why I say go to it, only the Council says nix. I can say this much: she's put together so she'll stay together. I must of wired in a thousand of them damage sensors myself, and that ain't a spot on what's on the diagram. 'Pain circuits,' old Doc Chin calls 'em. Says it's just like a instinct for self-preservation or something, like people. Old Denny can hurt, he says, so he'll be all the better at dodging enemy fire. He can enjoy, too, Doc says. He gets a kick out of doing his job right, and out of learning stuff. And he learns fast. He'll do OK against them durn Peepreps. They got him programmed right to the brim with everything from the way them Greeks used to fight with no pants to Avery's Last Stand at Leadpipe. He ain't no dumb private; he's got more dope to work on than any general ever graduated from the Point. And he's got more firepower than an old-time army corps. So I think maybe General Bates got aholt of a good idear, there, myself. Says he can put her in the gap in his line and field-test her for fair, with the whole durn Peeprep army and air force for a test problem. Save the gubment some money, too. I heard Doc Chin say the full-scale field test mock-up would run GM a hundred million and another five times that in army R & D funds. He had a map showed where he could use Denny here to block off the south end of Grand Crevasse where the Peeprep armor will have to travel 'count of the rugged terrain north of Cold City, and bottle 'em up slick as a owl's peter. I'm for it, durn it. Let Denny have his chance. Can't be no worse'n having them Comrades down here running things even worse'n the gubment."

15

"You don't understand, young man. My goodness, I'm not the least bit interested in bucking the line, as you put it. Heavens, I'm going back to my apartment—"

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"I'm sorry, ma'am, I got my orders; this here ain't no drill; you got to keep it closed up. They're loading as fast as they can. It's my job to keep these lines moving right out the lock, so they get that flat loaded and get the next one up. We got over a million people to load by 6 AM deadline. So you just be nice, ma'am, and think about all the trouble it'd make if everybody decided to start back upstream and jam the elevators and all."

16

Beats me. Course, the good part about being just a hired man is I got no big decisions to make, so I don't hafta know what's going on. Seems like they'd let me know something, though. Batesey was down again, spent a hour with old Denny, like I say, beats me; but he give me a new data can to program into her, right in her Action/Command section. Something's up. I just fired a N-class pulse at old Denny (them's the closest to the real thing) and she snapped her aft quarter battery around so fast I couldn't see it move. Old Denny's keyed-up, I know that much.

17

This has been a memorable time for me. I have my assignment at last, and I have conferred at length—for 2,037 seconds—with my commander. I am now a fighting unit of the 20th Virginia, a regiment ancient and honorable, with a history dating back to Terra Insula. I look forward to my opportunity to demonstrate my worthiness.

18

"I assure you, gentlemen, the rumor is unfounded. I have by no means authorized the deployment of 'an untested—and potentially highly dangerous machine,' as your memo termed it. Candidly, I was not at first entirely unsympathetic to the proposal of the Chief of Ground Forces in view of the circumstances—I presume you're aware that the PR committed its forces to invasion over an hour ago, and that they are advancing in overwhelming strength. I have issued the order to commence the evacuation, and I believe that the initial phases are even now in progress. I have the fullest confidence in General Bates and can assure you that our forces will do all in their power in the face of this dastardly sneak attack. As for the unfortunate publicity given to the earlier suggestion re the use of the Mark XX, I can tell you that I at once subjected the data to computer analysis here at Headquarters, to determine whether any potentially useful purpose could be served by risking the use of the new machine without prior test certification. The results were negative. I'm sorry, gentlemen, but that's it. They have the advantage both

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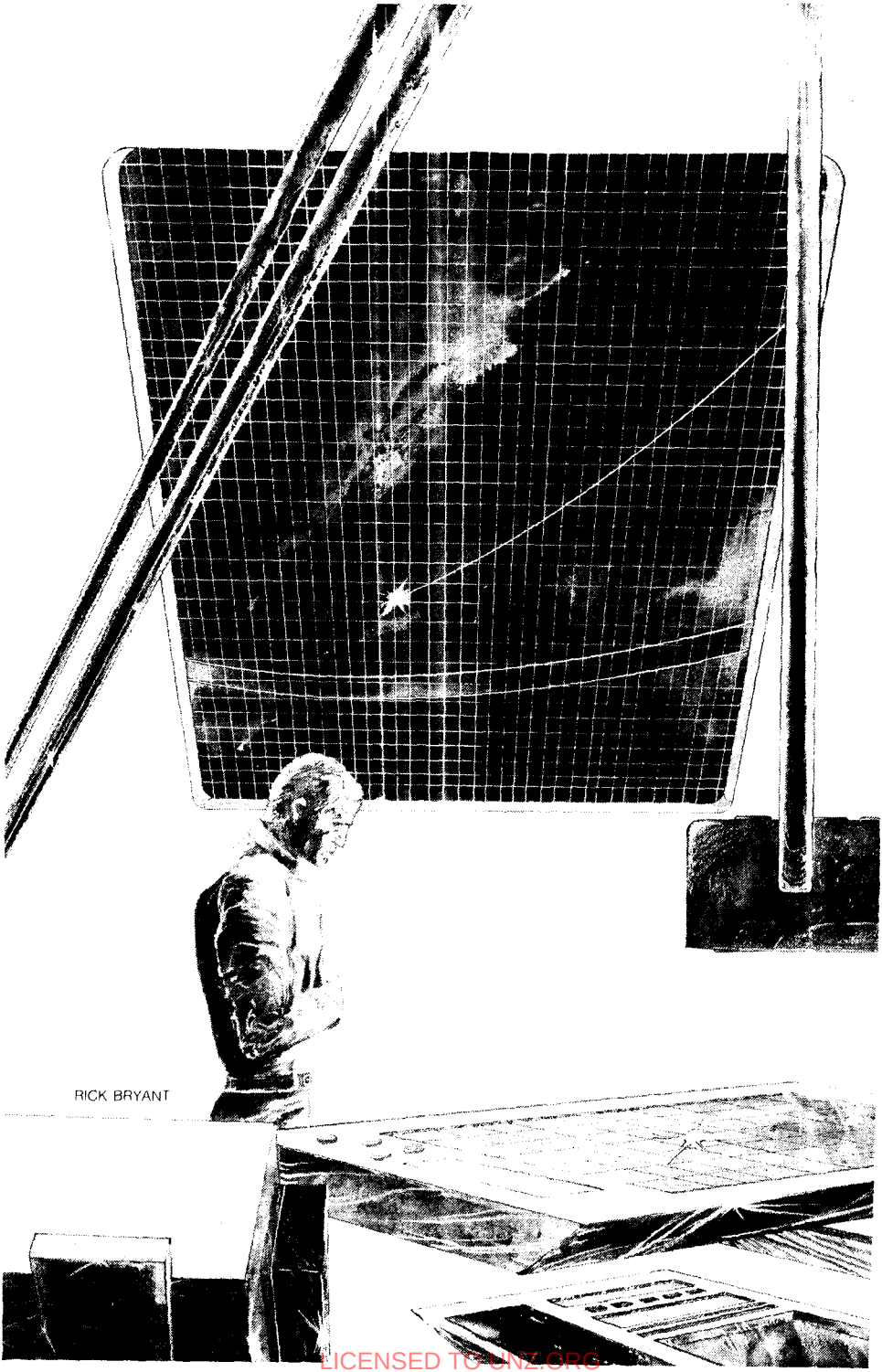

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strategically and tactically. We are out-gunned, out-manned, and in effect out-flanked. There is nothing we can do save attempt to hold them long enough to permit the evacuation to get underway, then retreat in good order. The use of our orbiting nuclear capability is out of the question. It is after all our own territory we'd be devastating. No more questions for the present, please, gentlemen. I have my duties to see to."

19

The situation as regards my own circumstances continues to deteriorate. The current status program has been updated to within 21 seconds of the present. The reasons both for what is normally a pre-engagement up-dating and for the hiatus of 21 seconds remain obscure. However, I shall of course hold myself in readiness for whatever comes.

20

It's all nonsense: to call me here at this hour merely to stand by and watch the destruction of our gallant men who are giving their lives in a totally hopeless fight against overwhelming odds. We know what the outcome must be. You yourself, General, informed us this afternoon that the big tactical computer has analyzed the situation and reported no possibility of stopping them with what we've got. By the way, did you include the alternative of use of the big, er, Bolo, I believe they're called—frightening things—they're so damned *big*. But if, in desperation, you should be forced to employ the thing—have you that result as well? I see. No hope at all. So there's nothing we can do. This is a sad day, General. But I fail to see what object is served by getting me out of bed to come down here. Not that I'm not willing to do anything I can, of course. With our people—innocent civilians—out on that blizzard-swept tundra tonight—and our boys dying to gain them a little time, the loss of a night's sleep is relatively unimportant, of course. But it's my duty to be at my best, rested and ready to face the decisions that we of the Council will be called on to make.

Now, General, kindly excuse my ignorance if I don't understand all this . . . but I understood that the large screen there was placed so as to monitor the action at the southern debouchment of Grand Crevasse where we expect the enemy armor to emerge to make its dash for Cold City and the Complex. Yes, indeed, so I was saying, but in that case, I'm afraid I don't understand. I'm quite sure you stated that the untried Mark XX would *not* be used. Yet, on the screen I see what appears to be in fact that very machine moving up. Please, calmly, General. I quite understand your position. Defiance of a direct order. That's rather serious, I'm sure, but no occasion for such language, General.

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There must be some explanation.

21

This is a most satisfying development. Quite abruptly, my introspection complex was brought up to full operating level, extra power resources were made available to my current-action memory stage, and most satisfying of all, my battle reflex circuit has been activated at active service level. Action is impending, I am sure of it. It is a curious anomaly: I dread the prospect of damage and even possible destruction, but even more strongly, I anticipate the pleasure of performing my design function.

22

"Yes, sir. I agree, it's mutiny. But I will not recall the Bolo and I will not report myself under arrest. Not until this battle's over, General. So the hell with my career. I've got a war to win."

23

Now just let me get this quite straight, General. Having been denied authority to field-test this new device, you—or a subordinate—which amounts to the same thing—have placed the machine in the line of battle, in open defiance of the Council. This is a serious matter, General. Yes, of course it's war, but to attempt to defend your actions now will merely exacerbate the matter. In any event—to return to your curious decision to defy Council authority and to reverse your own earlier position—it was yourself who assured me that no useful purpose could be served by fielding this experimental equipment—that the battle, and perhaps the war, and the very self-determination of West Continent are irretrievably lost. There is nothing we can do save accept the situation gracefully while decrying Chairman Smith's decision to resort to force. Yes, indeed, General, I should like to observe on the Main Tactical Display screen. Shall we go along?

24

Now, there at center screen, Mr. Councillor, you see that big blue rectangular formation. Actually that's the opening of Grand Crevasse, emerges through an ice tunnel, you know. Understand the Crevasse is a crustal fault, a part of the same formation that created the thermal sink from which the Complex draws its energy. Splendid spot for an ambush, of course, if we had the capability. Enemy has little option; like a highway in there—armor can move up at flank speed. Above, the badlands, where *we* must operate. Now, over to the left, you see that smoke, or dust or whatever. That represents the western limit of the unavoidable gap in General Bates' line. Dust raised by maneuvering Mark XV's, you understand. Obsolete equipment, but we'll do what we can with them.

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Over to the right, in the distance there, we can make out our forward artillery emplacement of the Threshold Line. Pitiful, really. Yes, Mr. Councillor, there is indeed a gap precisely opposite the point where the lead units of the enemy are expected to appear. Clearly, anything in their direct line of advance will be annihilated; thus General Bates has wisely chosen to dispose his forces to cover both enemy flanks, putting him in position to counterattack if opportunity offers. We must, after all, sir, use what we have. Theoretical arms programmed for fiscal 90 are of no use whatever today. Umm. As for that, one must be flexible, modifying plans to meet a shifting tactical situation. Faced with the prospect of seeing the enemy drive through our center and descend, unopposed, on the vital installations at Cold City, I have, as you see, decided to order General Bates to make use of the experimental Mark XX. Certainly; my decision entirely. I take full responsibility.

25

I advance over broken terrain toward my assigned position. The prospect of action exhilarates me, but my assessment of enemy strength indicates they are fielding approximately 17.4 percent greater weight of armor than anticipated, with commensurately greater fire power. I compute that I am grossly overmatched. Nonetheless, I do my best.

26

There's no doubt whatever, gentlemen. Computers work with hard facts. Given the enemy's known offensive capability, and our own defensive resources, it's a simple computation. No combination of the manpower and equipment at our command can possibly inflict a defeat on the PR forces at this time and place. Two is greater than one. You can't make a dollar out of fifteen cents.

27

At least we can gather some useful data from the situation, gentlemen. The Bolo Mark XX has been committed to battle. Its designers assure me that the new self-motivating circuitry will vastly enhance the combat effectiveness of the Bolo. Let us observe.

28

Hate to see old Denny out there, just a great big sitting duck, all alone and—here they come! Look at 'em boiling out of there like ants out of a hot log. Can't hardly look at that screen, them tactical nukes popping like fireworks all over the place. But old Denny knows enough to get under cover. See that kind of glow all around him? All right, *it*, then. You know, working with him—it—so long, it got to feeling almost like he was somebody. Sure, I know, anyway, that's vaporized ablative shield you see. They're making it plenty hot for

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him. But he's fighting back. Them Hellbores is putting out, and they know it. Looks like they're concentrating on him now. Look at them tracers closing in on him. Come on, Denny, you ain't dumb. Get out of there, fast.

29

Certainly it's aware what's at stake! I've told you he—the machine, that is, has been fully programmed and is well aware not only of the tactical situation, but of strategic and logistical considerations as well. Certainly it's an important item of equipment; its loss would be a serious blow to our present under-equipped forces. You may rest assured that its pain circuits as well as its basic military competence will cause it to take the proper action. The fact that I originally opposed commissioning the device is not to be taken as implying any lack of confidence on my part in its combat effectiveness. You may consider that my reputation is staked on the performance of the machine. It will act correctly.

30

It appears that the enemy is absorbing my barrage with little effect. More precisely, for each enemy unit destroyed by my fire 2.4 fresh units immediately move out to replace it. Thus it appears I am ineffective, while already my own shielding is suffering severe damage. Yet while I have offensive capability, I must carry on as my commander would wish. The pain is very great now, but thanks to my superb circuitry, I am not disabled, though it has been necessary to withdraw power from my external somatic sensors.

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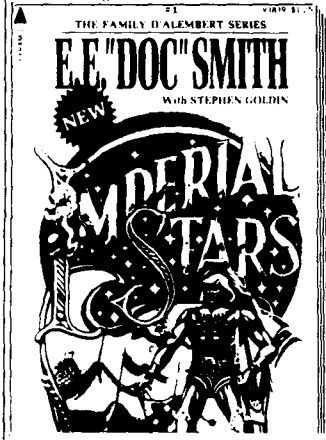

31

I can assure you, gentlemen, insofar as simple logic functions are concerned, the Mark XX is perfectly capable of assessing the situation, even as you and I, only better. Doubtless as soon as it senses that its position has grown totally untenable, it will retreat to the shelter of the rock ridge and retire under cover to a position from which it can return fire without taking the full force of the enemy's

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attack at point-blank range. It's been fully briefed on late developments, it knows this is a hopeless fight. There, you see? It's moving. . . .

32

I thought you said—dammit, I *know* you said your pet machine had brains enough to know when to pull out. But look at it: half a billion plus of Concordiat funds being bombarded into radioactive rubbish. Like shooting fish in a barrel.

33

Yes, sir, I'm monitoring everything. My test panel is tuned to it across the board; I'm getting continuous reading on all still-active circuits. Battle Reflex is still hot. Pain circuits close to overload, but he's still taking it—I don't know how much more he can take, sir; already way past Redline; expected him to break off and get out before now.

34

It's a simple matter of arithmetic. There is only one correct course of action in any given military situation; the big tactical computer was designed specifically to compare data and deduce that sole correct action. In this case my read-out shows that the only thing the Mark XX could legitimately do at this point is just what the professor here says: pull back to cover and continue its barrage. The on-board computing capability of the unit is as capable of reaching that conclusion as is the big computer at HQ. So keep calm, gentlemen. It will withdraw at any moment, I assure you of that.

35

Now it's getting ready—no, look what it's doing! It's advancing into the teeth of that murderous fire. By God, you've got to admire that workmanship! That it's still capable of moving is a miracle. All the ablative metal is gone—you can see its bare armor exposed—and it takes some heat to make that flint-steel glow white!

36

Certainly, I'm looking. I see it. By God, sir, it's still moving—faster, in fact; charging the enemy line like the Light Brigade. And all for nothing, it appears. Your machine, General, appears less competent than you expected.

37

Poor old Denny. Made his play and played out, I reckon. Readings on the board over there don't look good; durn near every overload in him blowed wide open. Not much there to salvage. Emergency Survival Center's hot. Never expected to see *that.* Means all kinds of breakdowns inside. But it figures, after what he just went through. Look at that slag pit he drove up out of.

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They wanted a field test. Reckon they got it. And he flunked it.

38

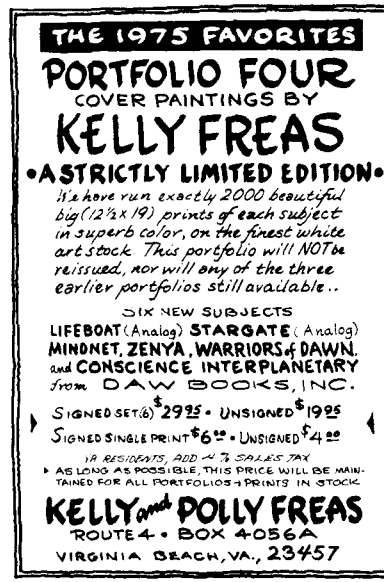
Violating orders and winning is one thing, George. Committing mutiny and losing is quite another. Your damned machine made a fool of me. After I stepped in and backed you to the hilt and stood there like a jack-ass and assured Councillor Grace that thing knew what it was doing—it blows the whole show. Instead of pulling back to save itself it charged to destruction. I want an explanation of this fiasco at once.

39

Look! No, by God, over *there!* On the left of the entrance. They're breaking formation—they're running for it! Watch this! The whole spearhead is crumbling, they're taking to the badlands—they're—

40

Why, dammit? It's outside all rationality. As far as the enemy's concerned, fine. They broke and ran. They couldn't stand up to the sight of the Mark XX not only taking everything they had, but advancing on them out of that inferno, all guns blazing. Another hundred yards and—but they don't know that. It buffaloed them, so score a battle won for our side. But why? I'd stack its circuits up against any fixed installation in existence including the big Tacomp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the army's so proud of. That machine was as aware as anybody that the only smart thing to do was run. So now I've got a junk pile on my hands. Some test! A clear flunk. Destroyed in action. Not recommended for Federal procurement. Nothing left but a few hot transistors in the Survival Center. It's a disaster, Fred. All my work, all your work, the whole program wrecked. Fred, you talk to General Bates; as soon as he's done inspecting the hulk he'll want somebody human to chew out.

41

Look at that pile of junk. Reading off the scale. Won't be cool enough to haul to Disposal for six

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months. I understand you're Chief Engineer at Bolo Division. You built this thing. Maybe you can tell me what you had in mind here. Sure, it stood up to fire better than I hoped. But so what? A stone wall can stand and take it. This thing is supposed to be *smart,* supposed to feel pain like a living creature. Blunting the strike at the Complex was a valuable contribution, but how can I recommend procurement of this junk-heap?

42

Why, Denny? Just tell me why you did it. You got all these military brass down on you, and on me, too. On all of us. They don't much like stuff they can't understand. You attacked when they figured you to run. Sure, you routed the enemy, like Bates says, but you got yourself ruined in the process. Don't make sense. Any dumb private, along with the generals, would have known enough to get out of there. Tell me why, so I'll have something for Bates to put on his Test Evaluation Report, AGF Form 1103-6, Rev 11/3/85.

43

"All right, Unit DNE of the line. Why did you do it? This is your Commander, Unit DNE. Report! Why did you do it? Now, you knew your position was hopeless, didn't you? That you'd be destroyed if you held your ground, to say nothing of advancing. Surely you were able to compute that. You were lucky to have the chance to prove yourself."

For a minute I thought old Denny was too far gone to answer. There was just a kind of groan come out of the amplifier. Then it firmed up. General Bates had his hand cupped behind his ear, but Denny spoke right up.

"Yes, sir."

"You knew what was at stake here. It was the ultimate test of your ability to perform correctly under stress, of your suitability as a weapon of war. You knew that. General Margrave and old Priss Grace and the press boys all had their eyes on every move you made. So, instead of using common sense, you waded into that inferno in defiance of all logic—and destroyed yourself. Right?"

"That is correct, sir."

"Then why? In the name of sanity why, instead of backing out and saving yourself, did you charge?

"Wait a minute, Unit DNE. It just dawned on me. I've been underestimating you. You knew, didn't you? Your knowledge of human psychology told you they'd break and run, didn't it?"

"No, sir. On the contrary, I was quite certain that they knew they held every advantage."

"Then that leaves me back where I started. Why? What made you risk everything on a hopeless attack? Why did you do it?"

"For the honor of the regiment." ■

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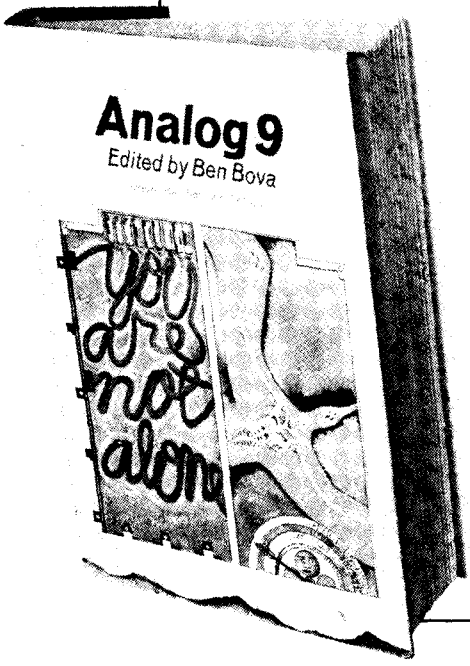

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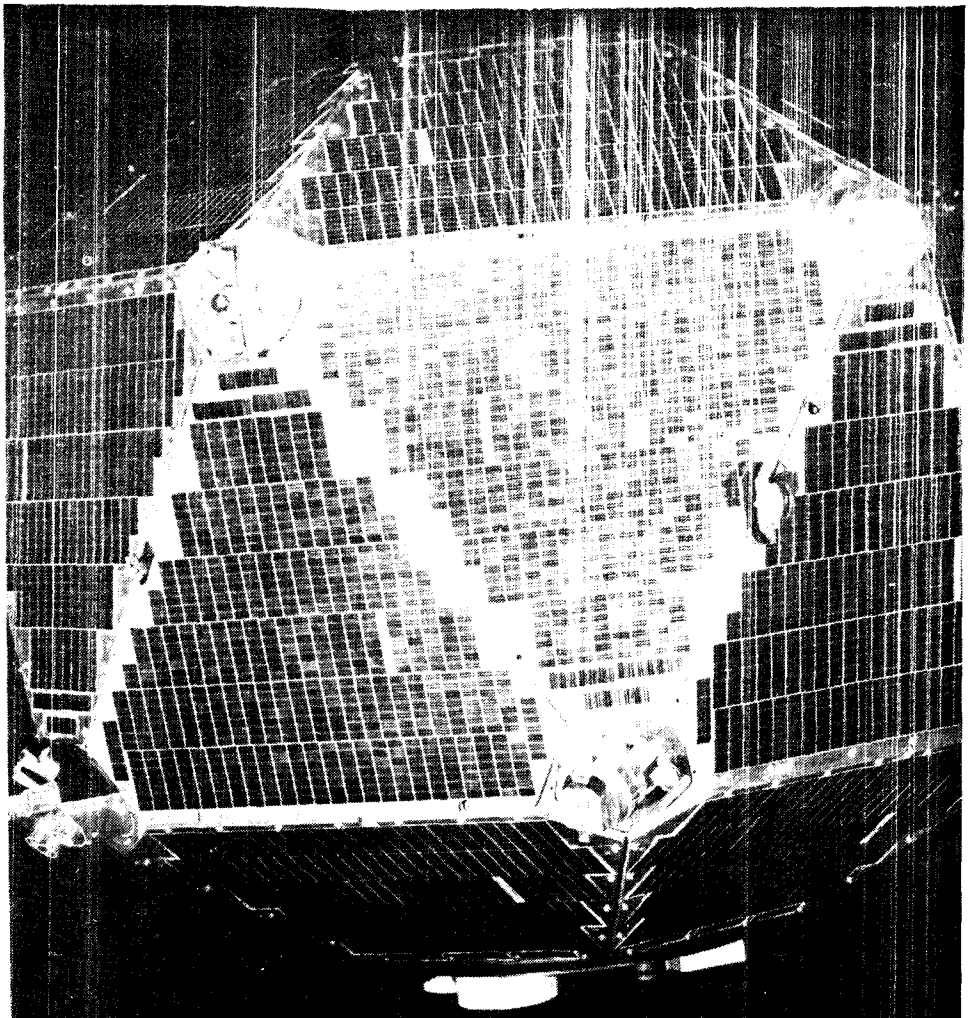

EVERY NOW AND THEN A

MARGARET L. SILBAR

One of the Vela satellites. These satellites were originally launched to monitor the sky for violations of the 1963 Nuclear Test Ban Treaty. Instead of violations, they picked up evidence of sporadic bursts of gamma rays.

Los Alamos Scientific Laboratory

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GAMMA PULSE

Place a gamma-ray-seeking satellite in orbit to detect clandestine nuclear bomb tests, and what do you get? Starquakes, maybe; or relativistic beebees!

Sir Arthur Eddington once suggested that, even if man had always lived on a completely cloudbound planet and had never seen the stars, he could have deduced their existence with pencil and paper. Perhaps. But who would have ever thought of astronomy's newest and most puzzling discovery, that of occasional intense bursts of gamma rays?

These bursts, in contrast to everything else "out there," come and go. All other known astronomical objects are continuously emitting the energy by which we detect them, be it visible light or whatever. The shortest of these short-lived phenomena last no more than a tenth of a second; the longest, a bit more than a minute. Not only do the bursts appear sporadically—about ten are seen at odd times each year—but no one is really sure yet where they are coming from. All that scientists can say is where they do *not* originate—neither from the Earth or its local vicinity, nor from the Sun, nor the Moon, nor the planets, nor the nearby stars.

The discovery of the bursts was a direct fallout of the 1963 Nuclear Test Ban Treaty, which prohibits nuclear explosions in outer space. Soon after, the US set up a network of Vela satellites to circle the globe and monitor our friends and other neighbors in this regard. Detectors aboard the satellites search the sky in all directions (just in case, for example, somebody is testing a bomb behind the Moon), for gamma rays from a nuclear explosion.

Instead of finding any evidence of clandestine nuclear testing, the watchdog satellites uncovered what may indeed turn into the astronomical discovery of the Seventies—infrequent bursts of gamma-ray photons, that is to say, quanta of electromagnetic radiation with energies at the far end of the electromagnetic spectrum. (See Figure 1.)

Where these gamma ray bursts fit into the cosmic scheme of things is still a complete mystery. One can hope, however, that they will eventually help us understand something more about the highest-energy processes in astrophysics, about the ways in which stars age and die. For it is the puzzles in science which often help us make the greatest advances in understanding the universe we live in.

The story begins with the actual discovery of these enigmatic gamma-ray bursts. After discussing what the bursts are and talking about "a typical event," we will turn to the models proposed to explain them. There is no lack of theories. At least one, that these gamma-ray bursts come from ex-

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panding supernovae shocks, preceded their discovery. Others range from the absurd* to those which are perhaps quite reasonable. But returning to the beginning . . .

Because the Earth's atmosphere is impenetrable to gamma rays, the discovery of these intense bursts had to wait until satellites, such as the Velas (one is shown on page 32), began circling the Earth above the atmosphere. Once we had the satellites, it was not difficult to adapt instruments from ground-based nuclear physics to them. For example, it is possible to use a "gamma-ray telescope," a set of plates of plastic material which scintillate under the impact of gamma rays.

The group responsible for examining the Vela satellite records and realizing *what* they contained is at Los Alamos Scientific Laboratory in New Mexico and includes Ian Strong, Ray Klebesadel, and Roy Olson. The first gamma-ray event was noticed in mid-1969, but it was sufficiently undetailed so no one was very sure what it was or where it came from. (Our Sun? The Moon? Just plain electronic noise?) Nothing much could be said until after the Velas 5 and 6 were launched in 1970, and brought in more and better data. Around the middle of 1972, it had become

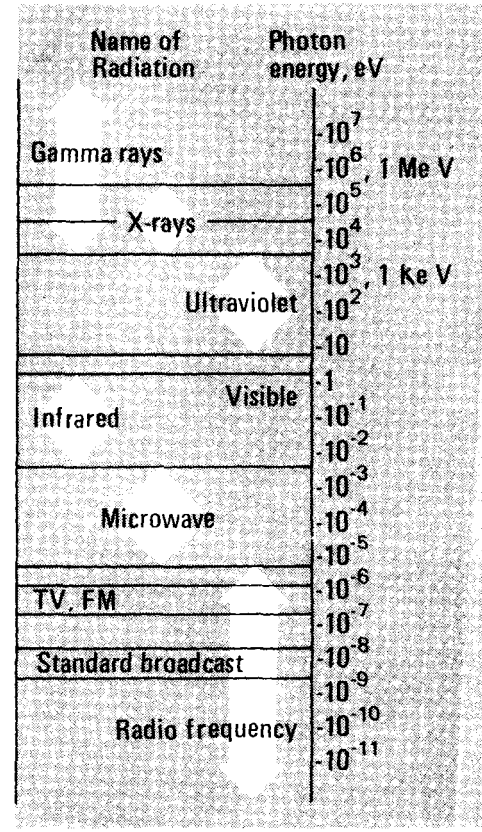

Figure 1. The electromagnetic spectrum, a continuous range of radiation from very short wavelength gamma rays to radio waves. Physically, the radiation is the same throughout the whole spectrum, the only difference from one part to another is in the frequency and wavelength.

clear that there were "bumps" in this data. A full-scale effort to refine the data followed, together with an unsuccessful search for correlations of these events with other astronomical "happen-

** In this category is the tongue-in-cheek "catastrophe theory"—that the bursts do indeed result from nuclear explosions, traces of a nuclear war between* other *civilizations far away on other stars.* Many *other civilizations, of course, since the bursts certainly don't all come from the same place.*

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ings," such as supernova explosions. By 1973, the group in Los Alamos had analyzed enough data to submit the first paper about these newly-found beasts to the *Astrophysical Journal.*

Their observations were then quickly confirmed and added to by other satellite data. (Even the Russians are watching the sky for gamma rays—for probably the same reasons we do.) Nonetheless, to date, the Los Alamos group can take credit for having seen more of these strange events than anyone else.

There has been an average of nine or ten events a year since mid-1969 (the beginning of recorded time in this endeavor). The average includes only those events seen by at least two widely separated satellites. For seven of the bursts, we have unique directions, that is, we know in which direction the gamma rays came from. The sources seem not to be concentrated in any one place, but are probably randomly located over the sky. We don't know, however, how far away any of the sources are (or were).

Assuming a source spews out gamma rays more or less isotropically, it is possible to calculate how luminous the source must have been, as a function of its distance from the Earth. If the source were some 300 light-years away, say, a luminosity of 10^{38} ergs* would be needed for us to pick up gamma-ray bursts like those seen. On the other hand, from where we sit to the edge of our galaxy is perhaps 30,000 light-years. A gamma-ray source from *that* far away would need to emit 10^{42} ergs of energy. (For comparison, this last number is about ten times more energy than our Sun emits in the course of a whole year.) As these examples make clear, it is *very* important to know how far away the sources are, if we want to understand the nature of these gamma-ray beasts.

Over a three-and-a-half-year period, the Vela gamma-ray detectors have been triggered twice on the same day, and other times, events were noted no more than a few days apart. Intriguingly, the bursts sometimes come in multiples. None of this tells us, yet, if the events occur quite independently of one another in all parts of the sky. Nor if there really are sources out there which repeat themselves.

What we do know about these bursts is that they consist of quite intense electromagnetic waves of very short wavelength. The energy spectrum of these gamma-ray photons is now known to be from 0.002 MeV* to 5 MeV. Most of the energy lies in a narrow range, 0.1 to 0.2 MeV. This is in contrast to

**An erg is a tiny unit of energy. A fifty-watt lamp radiates half a billion (0.5×10^9) ergs per second; 10^{10} ergs equal one kilowatt.*

**An MeV is just another unit of energy and is the energy necessary to accelerate an electron through a potential of one million volts. One MeV is 1.6×10^{-6} ergs. For comparison, a photon of visible light has an energy of 1 to 2 eV, 100,000 times less energetic than most of the observed gammas.*

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the "usual" gamma-ray astronomy, which deals with continuously emitting objects with somewhat larger photon energies in the 50 MeV or above region.

Now we are ready to talk about "a standard event." It starts out with a number of short precursor "spikes," as in Figure 2, which shows the output of one of the gamma-ray detectors on the spaceship Apollo 16. These last no more than 30 to 60 milliseconds. After another ten seconds, the main burst begins. This contains most of the radiation, lasts perhaps twenty seconds, and is not well understood. This part of the event can be divided into a number of sub-bursts, lasting about a second each. These sub-bursts may be superimposed on top of some kind of more continuous radiation, or they might be simply bursts like the precursor ones. Moreover, these sub-bursts may overlap one another, or they may be distinct. Interestingly enough, the radiation can "turn off" and "turn on" suddenly during the main burst of radiation.

Not all events look alike. Some take longer getting started and have more precursor spikes. Others are slower finishing, showing "trailing" spikes long afterwards. And, in fact, a few events from the Vela data seem to be structureless. (Is their structure too fine to be resolved by our present instruments?) The accumulated data on these burst events are, of course, not all that extensive yet, but we can expect that as years go by we will understand the details of the burst structure better and better. We are, after all, only at the beginning of this new kind of astronomy.

We now come to the theoretical models that purport to explain what these gamma-ray bursts are. If they can be said to have anything in common, it is that the majority depend upon some final cataclysmic stage in stellar evolution for part of their explanation. Whatever the model, it must not only be logically consistent, it must also account for the known properties of these bursts, such as their intensity, the frequency with which they occur, their duration, and their internal structure. Some models, as might be expected, succeed better than others. As one astrophysicist says, "Most of them have an equal probability of being correct," *i.e.*, no explanation as of now is clearly preferred by the data. We will begin with the first theory ever proposed and from there, group the others into three classes—the so-called accretion models, the flare models, and the "far-out" ones.

Historically, the first model was that of expanding supernovae shock waves. It went through several stages of development, and ended up predicting that if this is the origin of the gamma-ray bursts, the sources are extragalactic—something which no one believes anymore. In its earliest version, it pictured a star, somewhat more massive than our Sun, in the last stages of its life. Its internal source of energy had dwindled and it therefore exploded (*i.e.*, collapsed), producing gamma rays in the process. Since no one had yet seen any gamma-

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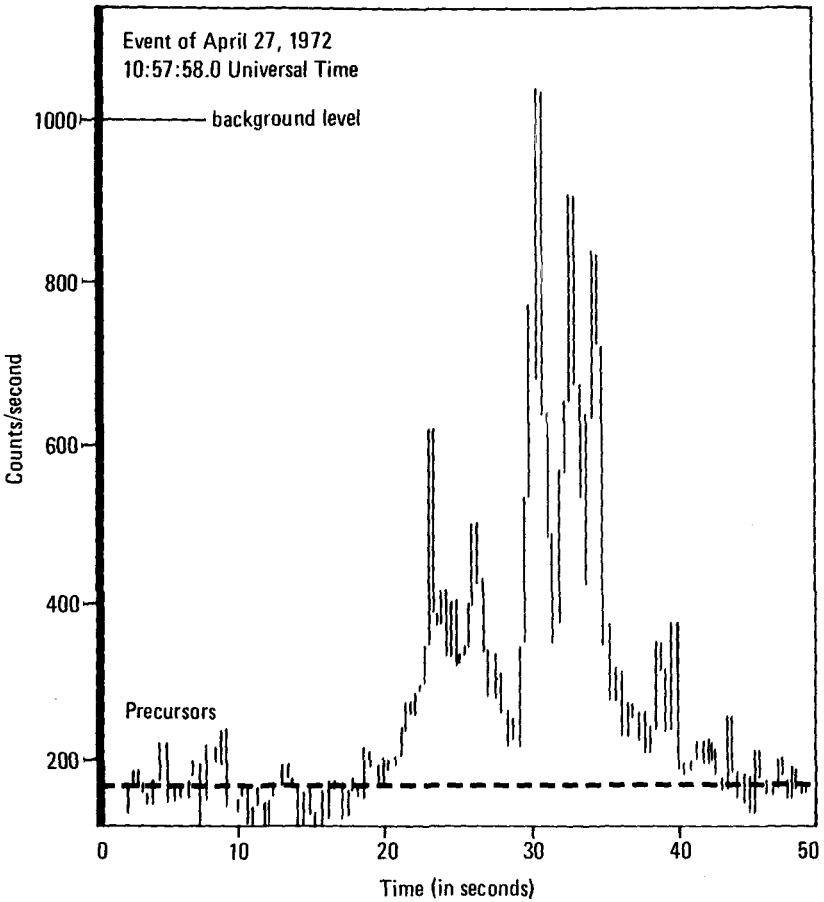

Figure 2. A typical event. Such an event consists of quite intense electromagnetic waves of very short wavelength. It begins with a number of short precursor spikes. This is followed by the main burst, which contains most of the radiation and lasts about five seconds. It ends with some "trailing" spikes like the precursors.

ray bursts, this early version didn't seem unreasonable. Any supernova explosion, which can, as it does, radiate as much energy in a single second as the Sun does in several years, might well involve some strange and interesting phenomena.

But supernova explosions don't happen every day. There have only been four or so in the last 900 years in our galaxy, the most famous being that recorded by Chi-

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nese and Japanese astronomers in 1054 AD as "a guest star" in the constellation Taurus. Equally important, the structure of the gamma-ray bursts predicted by the model didn't look very much like that shown in Figure 2.

To try and get around these difficulties, the proponents of this model exchanged Type I supernovae, those of older, more compact, hydrogen-poor stars, for Type II supernovae. Type II supernovae are those of the relatively young stars of the spiral arms of galaxies. They involve massive giant stars with extended hydrogen atmospheres, or envelopes.

According to the rewritten model, the dense central core of the giant star collapses and initiates a shock wave. As the shock wave rises to the surface of the star, it becomes relativistic. The further from the collapsed core the shock wave gets, the less dense the star is. Finally, when the stellar material is no longer very dense at all, the shock breaks through the surface of the pre-supernova star, yielding gamma-ray photons by bremsstrahlung.* The energy of the burst would be the internal energy in the stellar shock surface layer. This is where this model, as well as others, falls apart. There just isn't enough energy there to account for the kind of gamma-ray bursts the satellites have been picking up. Moreover, no gamma-ray burst accompanied the recent supernova explosion observed in the far-off galaxy NGC5253. Where we've seen a supernova explode, we haven't seen a gamma-ray burst. And in the directions we've seen the bursts, we haven't been able to find a supernova remnant.

Now there *is* a way of getting around this, albeit an artificial one. This involves postulating *ad hoc* "theoretician's supernovae"—supernovae which radiate weakly in visible wavelengths, but strongly in gamma-ray bursts. This means that *if* gamma-ray sources are indeed supernovae, they are not the supernovae we have come to know and love.

All other theoretical explanations of gamma-ray bursts were proposed after their discovery. Let us now turn to a group of models some physicists say are "the most promising of all." Here gamma-ray bursts are viewed as fleeting episodes, which take place when some type of matter falls onto a compact galactic object. This compact galactic object would, like all superdense stars, be born when the core of a supernova completely collapsed. It could be a white dwarf, a neutron star, or that most mysterious object of all, a black hole, which curves space and warps time. All of these objects lie in wait as alternatives for a dying star:

A white dwarf is a bankrupt star, which has shed most of its mass into space in a supernova explosion, retaining not quite as much as our Sun. It shrinks its

** "Bremsstrahlung" is the process by which electrons or other charged particles, when suddenly de-accelerated, emit electromagnetic radiation. The word comes from the German word for "brakes."*

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radius to conserve its diminishing resources. At the end, it is a densely packed sphere with a radius equal to about that of the Earth. A thimbleful of white dwarf matter would weigh a ton.

A neutron star, on the other hand, would have started out as a star rather larger than the Sun, and has contracted in the explosion until it is no more than a midget sphere with a radius of some ten kilometers. The stuff of which neutron stars are made is *extremely* dense, for it has reached nuclear densities. A thimbleful of this would weigh up to a billion tons. Neutron stars were no more than theoretical curiosities until the last few years when it was concluded that pulsars can only be quivering, rapidly-rotating neutron stars.

A black hole is, as neutron stars once were, strictly a hypothetical object. We suspect they exist because Einstein told us so in his laws about the structure of empty space. A black hole is said to be a simple thing: *i.e.*, its shape and all its properties are determined by its mass, angular momentum, and net electric charge. No one had begun seriously looking for these geometrical singularities in space-time until after the discovery of pulsars. Then the hunt was on. Some people now think the X-ray source called Cygnus X-1 might be one of these exotic creatures.

The models for gamma-ray bursts which use one or the other of these three compact stars are called accretion models. The star picks up some stray matter which, as it falls onto the star's surface, has its gravitational potential energy turned into the gamma-ray bursts that we see. The problem these models all share is that of explaining where the accreting matter comes from.

One way of providing the necessary matter is to propose a binary system, with one visible normal star and one invisible superdense star rotating around each other. This is exactly what a group of scientists at the University of Illinois did. A binary system is rather like a spinning dumbbell, but without the bar between the heavy balls. This dumbbell would, however, be a strange-looking one—with a tiny dense massive star at one end and a large, not-so-dense, but equally massive, star at the other. In the Illinois model, the normal star flares every once in a while and ejects matter, which falls on its compact neighbor.

But there is no sense talking about transferring mass from an ordinary star to a degenerate one if there aren't enough degenerates around. However, there do seem to be many compact stars within 300 light-years of the Earth. In our galaxy alone 50 white dwarfs are born every year, and thus one can imagine them turning up quite frequently in binaries. Without a detailed understanding of how neutron stars evolve, it's quite a bit harder to figure out how many of *these* might be born every year. Roughly, the Illinois astrophysicists

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estimate that one out of every 15 binaries with one superdense star might have a neutron star. And that perhaps the same would hold true for the even-less-well-understood black holes.

OK, so let us assume there is no problem getting, say, a neutron star together with an ordinary star. The model builders now had to estimate how often a normal star might flare. No one really has any data about star flares, other than those of the Sun. Taking the Sun as a prototype, it wouldn't be illogical to expect a few hundred to a few thousand flares a year. If the normal star ejects the same amount of matter as the Sun does when it flares (*i.e.*, ten billion tons of material), the neutron star would shoot off gamma rays of the observed energy as the matter hits its surface.

Which kind of superdense star is the more likely partner for the ordinary star? Black holes may be the least likely of the three candidates since we're not even sure they exist. White dwarfs, bless their degenerate cores, would need an almost prohibitively large accreting mass to come up with the needed energy for a burst like those seen. As one of the originators of this model says, "In choosing between possibilities, it's all a matter of energy."

Neutron stars are preferred, therefore, for they wouldn't need to draw such a large mass from a companion star, and, further, could convert gravitational energy into radiation (gamma-ray photons) with almost 100 percent efficiency.

One critic of this model points out that accretion to neutron stars is difficult, since the matter all ends up in too small an area—the polar regions—and the mass concentration would drastically impede the release of radiation. One way out of this is to assume the neutron star has an "accretion disk." Accretion disks are nothing new in astrophysics. They're a matter of plain old Newtonian theory. If the gaseous accretion matter has enough angular momentum, it will orbit its would-be-capturer in a thin disk, much as Saturn's rings. As long as the neutron star's magnetic field is negligible, there may well be nothing to stop its having such a disk of orbiting ionized gas. *

What we are left with here is a conundrum. The Illinois astrophysicists who authored this model seem to feel disks wouldn't be formed, and they have physical reasons for saying so. But if there are accretion disks, one of the three original discoverers of these bursts claims that plasma instabilities in them can explain all of the observed features of the gamma-ray bursts. "Right down," he says, "to little peculiarities not yet published." Only time and more data can tell us.

Another quite different accretion model comes from Cornell. Astrophysicists there suggest that old, galactic neutron stars may be surrounded by a cloud of comets, similar to that around the Sun. In this model, a comet is sometimes broken up as it passes close by the mother neutron star. The fragments

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* *Black holes could also have accretion disks.*

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might again orbit the neutron star. Later, maybe the next time around, some of this debris would be captured by the neutron star and guided onto the star's surface by magnetic torques. Once they fell upon the star, a gravitational energy equal to that of the mass of the comet fragments would be released, and gamma and X-rays produced. True, the major portion of the radiation would be in the X-ray region, but the authors of this model feel the neutron star, infused with this new energy, would have little trouble in *also* making gamma rays.

In fact, another way of producing gamma rays might be as follows. The cometary material would contain a large number of oxygen nuclei (from ice), and when these fell on the star's surface at high speeds, they would react to produce new nuclei through fusion. Such nuclear reactions would give off additional gamma rays. No one really knows, however, how efficiently gamma rays might be produced by this method.

Now, how many comet impacts would be needed to yield the observed number of gamma-ray bursts? If only three percent of the energy * released by an average-size comet were converted into gamma radiation, that would be enough (assuming the star were about 90 light-years away). Within this distance, there are perhaps 3,000 nearby neutron stars, and each would have to generate no more than a gamma-ray burst once every 600 years. "Is this reasonable?" ask the Cornell astrophysicists. Answer: "It's difficult to say."

Another class of models center around flares on some type of star, sometimes, but not always, an old and dying star. Imaginations cut loose here and these flares are variously called "ghouls," "goblins," and "glitches." More than one astrophysicist has labeled these models "out-and-out nonsense," but let's take a look at two of them, anyway.

A Russian group points to young pulsars like those in the Crab and Vela Nebulae and proposes they are not only spitting out the continously pulsing radio waves, but also the sporadic gamma rays. These pulsars, they say, have large "glitches" every few years, which observationally are sudden changes in the pulsing frequency. The "glitches" are, presumably, caused by a starquake or volcano, and these bring material up from the core of the neutron star to the stellar surface. When such matter is suddenly brought to the stellar surface, its nuclei are too neutron-rich to remain stable. So they decay to more stable species (*i.e.*, more or less equal numbers of protons and neutrons), emitting, among other things, a lot of gamma rays.

The problem with models like this is that no one knows much about starquakes and "glitches." In addition, the pulsar in the constellation Vela recently "glitched," that is to say, it changed its pulsing frequency, and no one could see

* *"A figure which," the Cornell astrophysicists say, "may be grossly in error."*

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any evidence of an accompanying gamma-ray burst. Bad news for the Russian model.

Approaching the problem in a slightly different way, two astrophysicists at Goddard Space Flight Center looked to the Sun, which emits X-rays, for clues as to what might be happening elsewhere in the galaxy. This led them to consider the possibility of giant stellar flares on magnetic white dwarfs. If indeed a white dwarf were to flare, and radiate gamma rays, these flares would at the very least need a million times more energy than the brightest of the solar flares. The feebly-shining white dwarfs do have intense magnetic fields, which might help. If they do flare, each white dwarf within 300 light-years would need to do so only once every few decades in order to explain the gamma-ray bursts we've been seeing.

But having the energy needed to do something isn't necessarily enough. Somehow the gamma rays have got to get out, and, to date, no mechanism has been proposed for that in this model. Also, it is hard to believe that the canonical explanation for the birth of solar flares can be extended to white dwarfs, since the surfaces of the Sun and a white dwarf just aren't the same.

The last group of theories can only be titled "the far-out ones," invoking as they do, the existence of even stranger things, perhaps suspected on speculative grounds but by no means known to exist. There are many such proposals. Here we will only consider one of them. *

The "relativistic beebee" model comes from the Center for Astrophysics in Cambridge, Massachusetts, and suggests that very fast-moving grains of iron, the size of beebees, fall on our Solar System. These grains presumably come from pulsars in neutron stars (the "glitches" again?) and are accelerated to such high speeds by the pulsar's electromagnetic field.

According to the model, the "beebees" would be moving toward the Solar System at relativistic speeds. By the time they had traveled to, within, say, a distance 30 times Pluto's orbit, they would probably be melting and evaporating into their constituent iron atoms. Naturally, they would interact with sunlight and the Sun's photons hitting them would break them up still more. As they ionize, *i.e.*, have their electrons stripped off, X-rays would be radiated. Most of the grains would be radiating by the time they were no further away than Pluto. Since these "beebees" would be raining down on the Solar System at relativistic speeds, the X-radiation could be blue-shifted by the Doppler effect into gamma rays.

Could these be the gamma rays the satellites are seeing? Possibly. But, as one critical astrophysicist wonders, "Can Nature really be quite as ingenious as the authors of this model?"

** The possibility of comets with tails of antimatter falling on black holes seems not to have been seriously proposed by anyone yet. Maybe later.*

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We now come to the end of our discussion of theoretical proposals for explaining gamma-ray bursts—which is not to say there are no more. Sometimes it almost seems the experimental data will drown in an ocean of theories. But one shouldn't be discouraged about the wealth of theories, even those which are really no more than a gleam in someone's eye. For pulsars, after all, were identified as neutron stars, largely by eliminating all the other many and varied possibilities, one by one.

The first model, that of expanding supernovae shocks, remains interesting historically because it was developed in sufficient detail so that, for all practical purposes, it could be discarded. There now seems to be enough information about these enigmatic bursts that some physicists will claim that only the accretion models are reasonable. *If* the structure of all the bursts is exactly the same. This is the big "if." There may, however, be more than one kind of burst. Most seem to be like that in Figure 2, but then there are those little short bursts with no structure at all. To answer this, we need more data.

Who knows what lurks behind these unexplained gamma-ray sources? Right now, no one for sure. Perhaps, in a few years, all of us. ■

GLOSSARY

Gamma ray—An X-ray of very short wavelength. These are the shortest known electromagnetic waves.

Supernova—A star which has used up its internal sources of energy and which explodes, shedding matter into space. Its core may later collapse, to form a white dwarf, or neutron star, or, perhaps, a black hole.

White dwarf—A star which started out with a mass greater than Jupiter's and which has collapsed to about the size of Earth.

Neutron star—A stellar corpse of a star much more massive than the Sun, which exploded as a supernova. Afterwards, a quivering pulsing neutron star with a radius of ten kilometers remains. A *pulsar* is a neutron star, which is rapidly rotating and spewing out particle streams and sharp radio pulses. These pulses are regular with periods of a second or so.

Black hole—A gravitational singularity. No one has yet seen one, but theory says a typical one would have a mass between three and 50 times that of our Sun and a circumference between 60 and 1,000 kilometers.

SIGNS OF THE TIMES

Although quantum mechanics, electricity and magnetism, optics and nuclear reactions are the backbone of the physics program at Syracuse University, undergraduate students can also study the physical basis of toys, the physics of science fiction and the art and logic of guessing.

Syracuse University News Bureau

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CHILDREN OF DUNE

Part Three of Four Parts. Ecology—the sum total of all the factors that make an environment what it is—includes the emotional and mental attitudes of the people in that environment.

FRANK HERBERT

JOHN SCHOENHERR

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SYNOPSIS

Many on Dune believe that Muad-'Dib (born Paul Atreides), the Fremen Messiah who wandered into the desert and was believed dead, has returned as The Preacher, a blind mystic who roams the desert planet speaking heresy against the politico-religious empire ruled by Muad-'Dib's sister, Alia.

Leto and Ghanima, the orphaned twins of Muad'Dib and his Fremen

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concubine, Chani, have not seen The Preacher but know the stories about him. Like their Aunt Alia, the twins are pre-born, awakened in the womb with all memories of every ancestor, a condition produced by genetic susceptibility to the melange geriatric spice which is a Dune monopoly and basis of Atreides power. The millennial breeding program of the Bene Gesserit Sisterhood produced this susceptibility, but the Sisterhood fears it because the pre-born become Abomination, possessed by a malignant ancestor.

The twins recognize that Alia is possessed by the persona of the late Baron Harkonnen, an ancestor of peculiarly nasty habits and abiding hatred of Muad'Dib's Family Atreides. The twins fear that they, too, may succumb to Abomination. Trying to assume the memory-roles of their parents, Leto and Ghanima have learned that the hero-messiah image of Muad'Dib must be discredited. But Ghanima is almost trapped by the persona of her mother, Chani, and the twins learn by this that any possession reduces the possessed to Abomination.

Their grandmother, Lady Jessica, a Sisterhood-trained Reverend Mother, returns to Dune from self-imposed exile, bringing her trusted aide, Gurney Halleck, and finds a maelstrom of plots. Leto and Ghanima plus the melange monopoly are a magnet for countless dreams of power and riches. Although addictive and imparting a total blueness to the eyes, melange remains the most valuable product in the Empire. It's a geriatric drug which imparts psychic powers to some. Melange gave Muad'Dib true prescience. Bene Gesserit Reverend Mothers require it to balance the multi-psyche condition which their rites impart. Spacing Guild navigators must have melange for the limited prescience with which to trace safe translight pathways through the void. Fremen hold the spice sacred, using it in religious orgies.

Duncan Idaho, Alia's husband and a mentat human computer, believes the plots stem from CHOAM, financial arm of the Landsraad, which is the political union of Great Families who rule planetary fiefdoms under the Empire. Idaho, an Atreides retainer who once died saving Muad'Dib and Jessica, was restored to life in regeneration tanks by the Tleilaxu, who gave this ghola mysterious metal eyes. He believes the plots are aimed at the twins, but Alia insists she is the only target, an insistence shared by Irulan, the Corrino Princess who was Muad'Dib's wife but not mate. The Corrinos once ruled the Empire, but their Sardaukar were defeated by Muad'Dib's Fremen.

Alia has ordered Idaho to abduct Jessica, making it appear an act of House Corrino. Idaho, seeing that Alia is Abomination, agrees but secretly vows to carry out the plot in his own way. Leto, telling Jessica she will find an "interesting student"

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orders her to allow the abduction.

Stilgar, the old Fremen Naib who served Muad'Dib and now guards the twins, has been led by Leto to doubt traditional Fremen ways. Jessica, knowing Leto and Ghanima manipulate people (including herself), sends Halleck to trap Leto and subject him to perilous training. Halleck, through threads of information imparted by Ghanima to Jessica, heads for the mysterious sietch of Jacurutu.

Although she knows it's a plot to discredit her, Jessica accepts Alia's invitation to attend the Regency Council and judge supplicants. One supplicant is Ghadhean al-Fali, an old Naib who speaks as a Fedaykin death commando to whom the Atreides have obligations. Al-Fali pleads that Ecological Transformation, reducing the deserts, is destroying the giant sandworms which produce melange. As al-Fali demands his Fedaykin right of audience, one of Alia's priests tries to assassinate Jessica. Al-Fali kills the priest and, with Jessica, escapes the audience chamber, fleeing to one of the old sietch hideaways. This precipitates an abortive revolt by the desert tribes against the urbanized Imperial Fremen. A delicate truce follows.

Meanwhile, the twins have gone into the desert carrying Fremen gear and baited robes designed to bring an attack upon them by Laza Tigers. These tigers were assassination-trained on Salusa Secundus by the Corrinos under Wensicia, Irulan's sister, aided by a Sardaukar attendant, the Bashar Tyekanik. They seek to regain the Imperial throne for a Corrino, Wensicia's son, Prince Farad'n. This Prince is a strange young man who shares some of the Atreides ancestry. He seeks to emulate Paul-Muad'Dib, is spice-addicted and reads deeply into Atreides history.

While Jessica waits at Red Cavern Sietch with Fedaykin supporters, Idaho comes as though a messenger from Stilgar. Idaho abducts Jessica, saying he does The Preacher's bidding, that she must teach Farad'n as once she taught Paul. He takes her to Farad'n, who accepts Jessica as his teacher, bargaining for time in which his Sardaukar can grow stronger and the Fremen weaker. Jessica's price is banishment for Wensicia.

The twins, besieged in a rocky cleft where the tigers cannot quite reach them, kill both beasts with poisoned crysknives, but Ghanima is injured. She returns to Stilgar's Sietch Tabr under hypnotic compulsion to believe that Leto died saving her. This is the twins' way of diverting Alia and other plotters while their own plans are developed. Returning to Tabr, Ghanima kills the traitor who controlled the Laza Tigers, captures the woman who is a key to exposing many plotters in Tabr.

Leto, knowing he must discredit his father's memory, goes into the desert after his own dream vision: a

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Golden Path in which Leto must wear a "terrible skin" which imparts enormous powers. His goal is Jacurutu, a place lost in Fremen mythology, but which Leto knows to be real, a sinister place called Fondak which is a contact point for spice smugglers.

And Idaho, on Salusa Secundus, seeks audience with Jessica. Farad'n cannot understand why Idaho seeks this audience when the man must know that every word, every gesture will be spied upon.

Part Three

Above all else, the mentat must be a generalist, not a specialist. It is wise to have decisions of great moment monitored by generalists. Experts and specialists lead you quickly into chaos. They are a source of useless nit-picking, the ferocious quibble over a comma. The mentat-generalist, on the other hand, should bring to decision-making a healthy common sense. He must not cut himself off from the broad sweep of what is happening in his universe. He must remain capable of saying: "There's no real mystery about this at the moment. This is what we want now. It may prove wrong later, but we'll correct that when we come to it." The mentat-generalist must understand that anything which we can identify as our universe is merely part of larger phenomena. But the expert looks backward; he looks into the narrow standards of his own specialty. The generalist looks outward; he looks for living principles, knowing full well that such principles change, that they develop. It is to the characteristics of change itself that the mentat-generalist must look. There can be no permanent catalog of such change, no handbook or manual. You must look at it with as few preconceptions as possible, asking yourself: "Now, what is this thing doing?"

—The Mentat Handbook

It was the day of the Kwisatz Haderach, the first Holy Day of those who followed Muad'Dib. It recognized the deified Paul Atreides as that person who was everywhere simultaneously, the male Bene Gesserit who mingled both male and female ancestry in an inseparable power to become the One-With-All. The faithful called this day *Ayil*, the Sacrifice, to commemorate the death which made his presence "real in all places."

The Preacher chose the early morning of this day to appear once more in the plaza of Alia's temple, defying the order for his arrest which everyone knew had been issued. The delicate truce prevailed between Alia's Priesthood and those desert tribes which had rebelled, but the presence of this truth could be felt as a tangible thing which moved everyone in Arrakeen with uneasiness. The Preacher did not dispel that mood.

It was the twenty-eighth day of

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official mourning for Muad'Dib's son, six days following the memorial rite at Old Pass, which had been delayed by the rebellion. Even the fighting had not stopped the Hajj, though. The Preacher knew the plaza would be heavily thronged on this day. Most pilgrims tried to time their stay on Arrakis to cross *Ayil*, "to feel then the Holy Presence of the Kwisatz Haderach on His day."

The Preacher entered the plaza at first light, finding the place already thronged with the faithful. He kept a hand lightly on the shoulder of his young guide, sensing the cynical pride in the lad's walk. Now, when The Preacher approached, people noticed every nuance of his behavior. Such attention was not entirely distasteful to the young guide. The Preacher merely accepted it as a necessity.

Taking his stance on the third of the Temple's steps, The Preacher waited for the hush to come. When silence had spread like a wave through the throng and the hurrying footsteps of others come to listen could be heard at the plaza's limits, he cleared his throat. It was still morning-cold around him and light had not yet come down into the plaza from the building tops. He felt the gray hush of the great square as he began to speak.

"I have come to give homage and to preach in the memory of Leto Atreides II," he said, calling out in that strong voice so reminiscent of a wormsman from the desert. "I do it in compassion for all who suffer. I say to you what the dead Leto has learned, that tomorrow has not yet happened and may never happen. This moment here is the only observable time and place for us in our universe. I tell you to savor this moment and understand what it teaches. I tell you to learn that a government's growth and its death are apparent in the growth and death of its citizens."

A disturbed murmur passed through the plaza. Did he mock the death of Leto II? They wondered if Priest Guards would rush out now and arrest The Preacher.

Alia knew there would be no such interruption of The Preacher. It was her order that he be left unmolested on this day. She had disguised herself in a good stillsuit with a moisture mask to conceal her nose and mouth, and a common hooded robe to hide her hair. She stood in the second row beneath The Preacher, watching him carefully. Was this Paul? The years might have changed him thus. And he had always been superb with Voice, a fact which made it difficult to identify him by his speech. Still, this Preacher made his voice do what he wanted. Paul could not have done it better. She felt that she had to know his identity before she could act against him. How his words dazzled her!

She sensed no irony in The

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Preacher's statement. He was using the seductive attraction of definite sentences uttered with a driving sincerity. People might stumble only momentarily at his meanings, realizing that he had meant them to stumble, teaching them in this fashion. Indeed, he picked up the crowd's response, saying: "Irony often masks the inability to think beyond one's assumptions. I am not being ironic. Ghanima has said to you that the blood of her brother cannot be washed off. I concur.

"It will be said that Leto has gone where his father went, has done what his father did. Muad'Dib's Church says he chose in behalf of his own humanity a course which might appear absurd and foolhardy, but which history will validate. That history is being rewritten even now.

"I say to you that there is another lesson to be learned from these lives and their endings."

Alia, alert to every nuance, asked herself why The Preacher said *endings* instead of *deaths.* Was he saying that one or both were not truly dead? How could that be? A Truthsayer had confirmed Ghanima's story. What was this Preacher doing, then? Was he making a statement of myth or reality?

"Note this other lesson well!" The Preacher thundered, lifting his arms. "If you would possess your humanity, let go of the universe!"

He lowered his arms, pointed his empty sockets directly at Alia. He seemed to be speaking intimately to her, an action so obvious that several around her turned to peer inquiringly in her direction. Alia shivered at the power in him. This could be Paul. It could!

"But I realize that humans cannot bear very much reality," he said. "Most lives are a flight from selfhood. Most prefer the truths of the stable. You stick your heads into the stanchions and munch contentedly until you die. Others use you for their purposes. Not once do you live outside the stable to lift your head and be your own creature. Muad'Dib came to tell you about that. Without understanding his message, you cannot revere him!"

Someone in the throng, possibly a priest in disguise, could stand no more. His hoarse male voice was lifted in a shout: "You don't live the life of Muad'Dib! How dare you to tell others how they must revere him!"

"Because he's dead!" The Preacher bellowed.

Alia turned to see who had challenged The Preacher. The man remained hidden from her, but his voice came over the intervening heads in another shout: "If you believe him truly dead, then you are alone from this time forward!"

Surely it was a priest, Alia thought. But she failed to recognize the voice.

"I come only to ask a simple question," The Preacher said. "Is

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Muad'Dib's death to be followed by the moral suicide of all men? Is that the inevitable aftermath of a Messiah?"

"Then you admit him Messiah!" the voice from the crowd shouted.

"Why not, since I'm the prophet of his times?" The Preacher asked.

There was such calm assurance in his tone and manner that even his challenger fell silent. The crowd responded with a disturbed murmur, a low animal sound.

"Yes," The Preacher repeated, "I am the prophet of these times."

Alia, concentrating on him, detected the subtle inflections of Voice. He'd certainly controlled the crowd. Was he Bene-Gesserit-trained? Was this another ploy of the Missionaria Protectiva? Not Paul at all, but just another part of the endless power game?

"I articulate the myth and the dream!" The Preacher shouted. "I am the physician who delivers the child and announces that the child is born. Yet, I come to you at a time of death. Does that not disturb you? It should shake your souls!"

Even as she felt anger at his words, Alia understood the pointed way of his speech. With others, she found herself edging closer up the steps, crowding toward this tall man in desert garb. His young guide caught her attention: how bright-eyed and saucy the lad appeared! Would Muad'Dib employ such a cynical youth?

"I mean to disturb you!" The Preacher shouted. "It is my intention! I come here to combat the fraud and illusion of your conventional, institutionalized religion. As with all such religions, your institution moves toward cowardice, it moves toward mediocrity, inertia and self-satisfaction."

Angry murmurs began to arise in the center of the throng.

Alia felt the tensions and gloatingly wondered if there might not be a riot. Could The Preacher handle these tensions? If not, he could die right here!

"That priest who challenged me!" The Preacher called, pointing into the crowd.

He knows! Alia thought. A thrill ran through her, almost sexual in its undertones. This Preacher played a dangerous game, but he played it consummately.

"You, priest in your mufti," The Preacher called, "you are a chaplain to the self-satisfied. I come not to challenge Muad'Dib, but to challenge you! Is your religion real when it costs you nothing and carries no risk? Is your religion real when you fatten upon it? Is your religion real when you commit atrocities in its name? Whence comes your downward degeneration from the original revelation? Answer me, Priest!"

But the challenger remained silent. And Alia noted that the crowd once more was listening with avid

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submission to The Preacher's every word. By attacking the Priesthood, he had their sympathy! And if her spies were correct, most of the pilgrims and Fremen on Arrakis believed this man was Muad'Dib.

"The son of Muad'Dib risked!" The Preacher shouted, and Alia heard tears in his voice. "Muad'Dib risked! They paid their price! And what did Muad'Dib achieve? A religion which is doing away with him!"

How different those words if they come from Paul himself, Alia thought. *I must find out!* She moved closer up the steps and others moved with her. She pressed through the throng until she could almost reach out and touch this mysterious prophet. She smelled the desert on him, a mixture of spice and flint. Both The Preacher and his young guide were dusty, as though they'd recently come from the bled. She could see where The Preacher's hands were deeply veined along the skin protruding from the wrist seals of his stillsuit. She could see that one finger of his left hand had worn a ring; the indentation remained. Paul had worn a ring on that finger: the Atreides Hawk which now reposed in Sietch Tabr. Leto would have worn it had he lived . . . or had she permitted him to ascend the throne.

Again, The Preacher aimed his empty sockets at Alia, spoke intimately, but with a voice which carried across the throng.

"Muad'Dib showed you two things: a certain future and an uncertain future. With full awareness, he confronted the ultimate uncertainty of the larger universe. He stepped off *blindly* from his position on this world. He showed us that men must do this always, choosing the uncertain instead of the certain." His voice, Alia noted, took on a pleading tone at the end of this statement.

Alia glanced around, slipped a hand onto the hilt of her crysknife. *If I killed him right now, what would they do?* Again, she felt a thrill rush through her. *If I killed him and revealed myself, denouncing The Preacher as imposter and heretic!*

But what if they proved it was Paul?

Someone pushed Alia even closer to him. She felt herself enthralled by his presence even as she fought to still her anger. Was this Paul? Gods below! What could she do?

"Why has another Leto been taken from us?" The Preacher demanded. There was real pain in his voice. "Answer me, if you can! Ahhhh, their message is clear: abandon certainty." He repeated it in a rolling stentorian shout: "Abandon certainty! That's Life's deepest command. That's what Life's all about. We're a probe into the unknown, into the uncertain. Why can't you hear Muad'Dib? If certainty is knowing absolutely an

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absolute future, then that's only death disguised! Such a future becomes *now*! He showed you this!"

With a terrifying directness, The Preacher reached out, grabbed Alia's arm. It was done without any groping or hesitation. She tried to pull away, but he held her in a painful grip; speaking directly into her face as those around them edged back in confusion.

"What did Paul Atreides tell you, woman?" he demanded.

How does he know I'm a woman? she asked herself. She wanted to sink into her inner lives, ask their protection, but the world within remained frighteningly silent, mesmerized by this figure from their past.

"He told you that completion equals death!" The Preacher shouted. "Absolute prediction is completion, is death!"

She tried to pry his fingers away. She wanted to grab her knife and slash him away from her, but dared not. She had never felt this daunted in all of her life.

The Preacher lifted his chin to speak over her to the crowd, shouted: "I give you Muad'Dib's words! He said--'I'm going to rub your noses in things you try to avoid. I don't find it strange that all you want to believe is only that which comforts you. How else do humans invent the traps which betray us into mediocrity? How else do we define cowardice?' That's what Muad'Dib told you!"

Abruptly, he released Alia's arm, thrust her into the crowd. She would have fallen but for the press of people supporting her.

"To exist is to stand out, away from the background," The Preacher said. "You aren't thinking or really existing unless you're willing to risk even your own sanity in the judgment of your existence."

Stepping down, The Preacher once more took Alia's arm—no faltering or hesitation. He was gentler this time, though. Leaning close, he pitched his voice for her ears alone, said: "Stop trying to pull me once more into the background, sister."

Then, hand on his young guide's shoulder, he stepped into the throng. Way was made for the strange pair. Hands reached out to touch The Preacher, but people reached with an awesome tenderness, fearful of what they might find beneath that dusty Fremen robe.

Alia stood alone in her shock as the throng moved out behind The Preacher.

Certainty filled her. It was Paul. No doubt remained. It was her brother. She felt what the crowd felt. She had stood in the sacred presence and now her universe tumbled all about her. She wanted to run after him, pleading for him to save her from herself, but she could not move. While others pressed to follow The Preacher and his guide, she stood intoxicated with an absolute despair, a distress so deep that she could only tremble

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with it, unable to command her own muscles.

What will I do? What will I do? she asked herself.

Now, she did not even have Duncan to lean upon, nor her mother. The inner lives remained silent. There was Ghanima, held securely under guard within the Keep, but Alia could not bring herself to take this distress to the surviving twin.

Everyone has turned against me. What can I do?

The one-eyed view of our universe says you must not look far afield for problems. Such problems may never arrive. Instead, tend to the wolf within your fences. The packs ranging outside may not even exist.

—The Azhar Book;
Shamra I:4

Jessica awaited Idaho at the window of her sitting room. It was a comfortable room with soft divans and old-fashioned chairs. There wasn't a suspensor in any of her rooms, and the glowglobes were crystal from another age. Her window overlooked a courtyard garden one story down.

She heard the servant open the door, then the sound of Idaho's footsteps on the wood floor, then on the carpet. She listened without turning, kept her gaze upon the dappled light of the courtyard's green floor. The silent, fearful warfare of her emotions must be suppressed now. She took the deep breaths of her prana-bindu training, felt the outflow of enforced calmness.

The high sun threw its searchlight along a dustbeam into the courtyard, highlighting the silver wheel of a spiderweb stretched in the branches of a linden tree which reached almost to her window. It was cool within her quarters, but outside the sealed window there was air which trembled with petrified heat. Castle Corrino sat in a stagnant place which belied the greens in her courtyard.

She heard Idaho stop directly behind her.

Without turning, she said: "The gift of words is the gift of deception and illusion, Duncan. Why do you wish words with me?"

"It may be that only one of us will survive," he said.

"And you wish me to make a good report of your efforts?" She turned, saw how calmly he stood there, watching her with those gray metal eyes which held no center of focus. How blank they were! "Duncan, is it possible that you're jealous of your place in history?" She spoke accusingly and remembered as she spoke that other time when she'd confronted this man. He'd been drunk then, set to spy upon her, and was torn by conflicting obligations. But that had been a pre-ghola Duncan. This was not the same man at all. This one was not divided in his actions, not torn.

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He proved her summation by smiling. "History holds its own court and delivers its own judgments," he said. "I doubt that I'll be concerned when my judgment's handed down."

"Why are you here?" she asked.

"For the same reason you're here, My Lady."

No outward sign betrayed the shocking power of those simple words, but she reflected at a furious pace: *Does he really know why I'm here?* How could he? Only Ghanima knew. Then had he enough data for a mentat computation? That was possible. And what if he said something to give her away? Would he do that if he shared her reason for being here? He must know their every movement, every word was being spied upon by Farad'n or his servants.

"House Atreides has come to a bitter crossroads," she said. "Family turned against itself. You were among my Duke's most loyal men, Duncan. When the Baron Harkonnen . . ."

"Let us not speak of Harkonnens," he said. "That was another age and your Duke is dead." And he wondered: *Couldn't she guess that Paul had revealed the Harkonnen blood in the Atreides?* What a risk that had been for Paul, but it had bound Duncan Idaho even more firmly to him. The trust in the revelation had been a coin almost too great to imagine. Paul had known what the Baron's people had done to Idaho.

"House Atreides is not dead," Jessica said.

"What is House Atreides?" he asked. "Are you House Atreides? Is it Alia? Ghanima? Is it the people who serve this House? I look at those people and they bear the stamp of a travail beyond words! How can they be Atreides? Your son said it rightly: 'Travail and persecution are the lot of all who follow me.' I would break myself away from that, My Lady."

"Have you really gone over to Farad'n?"

"Isn't that what you've done, My Lady? Didn't you come here to convince Farad'n that a marriage to Ghanima would solve all of our problems?"

Does he really think that? she wondered. *Or is he talking for the watchful spies?*

"House Atreides has always been essentially an idea," she said. "You know that, Duncan. We bought loyalty with loyalty."

"Service to the people," Idaho sneered. "Ahhh, many's the time I've heard your Duke say it. He must lie uneasy in his grave, My Lady."

"Do you really think us fallen that low?"

"My Lady, did you not know that there are Fremen rebels, they call themselves 'Maquis of the Inner Desert,' who curse House Atreides and even Muad'Dib?"

"I heard Farad'n's report," she

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said, wondering where he was leading this conversation and to what point.

"More than that, My Lady. More than Farad'n's report. I've heard their curse myself. Here's the way of it: 'Burning be on you, Atreides! You shall have no souls, nor spirits, nor bodies, nor shades nor magic nor bones, nor hair nor utterances nor words. You shall have no grave, nor house nor hole nor tomb. You shall have no garden, nor tree nor bush. You shall have no water, nor bread nor light nor fire. You shall have no children, nor family nor heirs nor tribe. You shall have no head, nor arms nor legs nor gait nor seed. You shall have no seats on any planet. Your souls shall not be permitted to come up from the depths, and they shall never be among those permitted to live upon good earth. On no day shall you behold Shai Hulud, but you shall be bound and fettered in the nethermost abomination and your souls shall never enter into the glorious light for ever and ever.' That's the way of the curse, My Lady. Can you imagine such hatred from Fremen? They consign all Atreides to the left hand of the damned, to the Woman-Sun which is full of burning."

Jessica allowed herself a shudder. Idaho undoubtedly had delivered those words with the same voice in which he'd heard the original curse. Why did he expose this to House Corrino? She could picture an outraged Fremen, terrible in his anger, standing before his tribe to vent that ancient curse. Why did Idaho want Farad'n to hear it?

"You make a strong argument for the marriage of Ghanima and Farad'n," she said.

"You always did have a single-minded approach to problems," he said. "Ghanima's Fremen. She can marry only one who pays no *fai*, no tax for protection. House Corrino gave up its entire CHOAM holdings to your son and his heirs. Farad'n exists on Atreides sufferance. And remember when your Duke planted the Hawk flag on Arrakis, remember what he said: 'Here I am; here I remain!' His bones are still there. And Farad'n would have to live on Arrakis, his Sardaukar with him."

Idaho shook his head at the very thought of such an alliance.

"There's an old saying that one peels a problem like an onion," she said, her voice cold. *How dare he patronize her? Unless he was performing for Farad'n's watchful eyes.*

"Somehow, I can't see Fremen and Sardaukar sharing a planet," Idaho said. "That's a layer which doesn't come off the onion."

She didn't like the thoughts which Idaho's words might arouse in Farad'n and his advisers, spoke sharply: "House Atreides is still the law in this Empire!" And she thought: *Does Idaho want Farad'n to believe he can regain the*

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throne without the Atreides?

"Oh, yes," Idaho said. "I almost forgot. Atreides Law! As translated, of course, by the Priests of the Golden Elixir. I have but to close my eyes and I hear your Duke telling me that real estate is always gained and held by violence or the threat of it. Fortune passes everywhere, as Gurney used to sing it. The end justifies the means? Or do I have my proverbs mixed up? Well, it doesn't matter whether the mailed fist is brandished openly by Fremen Legions or Sardaukar, or whether it's hidden in the Atreides Law—the fist is still there. And the onion layer won't come off, My Lady. You know, I wonder which fist Farad'n will demand?"

What is he doing? Jessica wondered. House Corrino would soak up this argument and gloat over it!

"So you think the Priests wouldn't let Ghanima marry Farad'n?" Jessica ventured, probing to see where Idaho's words might be leading.

"Let her? Gods below! The Priests will let Alia do whatever she decrees. She could marry Farad'n herself!"

Is that where he's fishing? Jessica wondered.

"No, My Lady," Idaho said. "That's not the issue. This Empire's people cannot distinguish between Atreides government and the government of Beast Rabban. Men die every day in Arrakeen's dungeons. I left because I could not give my sword arm another hour to the Atreides! Don't you understand what I'm saying, why I came here to you as the nearest Atreides representative? The Atreides Empire has betrayed your Duke and your son. I loved your daughter, but she went one way and I went another. If it comes down to it, I'll advise Farad'n to accept Ghanima's hand—or Alia's—only on his own terms!"

Ahhhh, he sets the stage for a formal withdrawal with honor from Atreides service, she thought. But these other matters of which he spoke, could he possibly know how well they did her work for her? She scowled at him. "You know spies are listening to every word, don't you?"

"Spies?" He chuckled. "They listen as I would listen in their place. Don't you know how my loyalties move in a different way? Many's the night I've spent alone in the desert and the Fremen are right about that place. In the desert, especially at night, you encounter the dangers of hard thinking."

"Is that where you heard Fremen curse us?"

"Yes. Among the al-Ourouba. At The Preacher's bidding, I joined them, My Lady. We call ourselves the Zarr Sadus, those who refuse to submit to the priests. I am here to make formal announcement to an Atreides that I've removed myself to enemy territory."

Jessica studied him, looking for betrayals of minutiae, but Idaho

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gave no indication that he spoke falsely or with hidden plans. Was it really possible that he'd gone over to Farad'n? She was reminded of her Sisterhood's maxim: *In human affairs, nothing remains enduring; all human affairs revolve in a helix, moving around and out.* If Idaho had really left the Atreides fold, that would explain his present behavior. He was moving around and out. She had to consider this as a possibility.

But why had he emphasized that he did The Preacher's bidding?

Jessica's mind raced and, having considered alternatives, she realized she might have to kill Idaho. The plan upon which she had staked her hopes remained so delicate that nothing could be allowed to interfere with it. Nothing. And Idaho's words hinted that he knew her plan. She gauged their relative positions in the room, moving and turning to place herself in position for a lethal blow.

"I've always considered the normalizing effect of the faufreluches to be a pillar of our strength," she said. Let him wonder why she shifted their conversation to the system of class distinction. "The Landsraad Council of the Great Houses, the regional Sysselraads, all deserve our . . ."

"You do not distract me," he said.

And Idaho wondered at how transparent her actions had become. Was it that she had grown lax in concealment, or had he finally breached the walls of her Bene Gesserit training? The latter, he decided, but some of it was in herself–a changing as she aged. It saddened him to see this just the way it saddened him to see the small ways the new Fremen differed from the old. The passing of the desert was the passing of something precious to humans and he could not describe this thing, no more than he could describe what had happened to the Lady Jessica.

Jessica stared at Idaho in open astonishment, not trying to conceal her reaction. Could he read her that easily?

"You will not slay me," he said. He used the Fremen words of warning: "Don't throw your blood upon my knife." And he thought: *I've become very much the Fremen.* It gave him a wry sense of continuity to realize how deeply he had accepted the ways of the planet which had harbored his second life.

"I think you'd better leave," she said.

"Not until you accept my withdrawal from Atreides service."

"Accepted!" She bit it off. And only after she'd uttered the word did she realize how much pure reflex had gone into this exchange. She needed time to think and reconsider. How had Idaho known what she would do? She did not believe him capable of leaping Time in the spice way.

Idaho backed away from her un-

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til he felt the door behind him. He bowed. "Once more, I call you My Lady and then never again. My advice to Farad'n will be to send you back to Wallach, quietly and quickly, at the earliest practical moment. You are too dangerous a toy to keep around. Although, I don't believe he thinks of you as a toy. You are working for the Sisterhood, not for the Atreides. I wonder now if you ever worked for the Atreides. You witches move too deeply and darkly for mere mortals ever to trust."

"A ghola considers himself a mere mortal," she jibed.

"Compared to you," he said.

"Leave!" she ordered.

"Such is my intention." He slipped out the door, passing the curious stare of the servant who'd obviously been listening.

It's done, he thought. *And they can read it in only one way.*

Only in the realm of mathematics can you understand Muad'Dib's precise view of the future. Thus: first, we postulate any number of point-dimensions in space. (This is the classic *n*fold extended aggregate, an aggregate of *n* dimensions.) Within this framework, *Time* as commonly understood becomes an aggregate of one-dimensional properties. Applying this to the Muad'Dib phenomenon, we find that either we are confronted by new properties of Time or (by reduction through the infinity calculus) we are dealing with separate systems which contain *n* body properties. For Muad'Dib, we assume the latter. As demonstrated by the reduction, the point dimensions of the *n*fold can only have separate existence within different frameworks of Time. Separate dimensions of Time are thus demonstrated to coexist. This being the inescapable case, Muad'Dib's predictions required that he perceive the *n*fold, not as extended aggregate, but as an operation within a single framework. In effect, he froze his universe into that one framework which was his view of Time.

—Palimbasha:
Lectures at Sietch Tabr

Leto lay at the crest of a dune peering across open sand at a sinuous rock outcropping. The rock lay like an immense worm atop the sand, flat and threatening in the morning sunlight. Nothing stirred there. No bird circled overhead; no animal scampered among the rocks. He could see the slots of a windtrap almost at the center of the rock-worm's back. There'd be water here. The rock-worm held the familiar appearance of a sietch shelter except for the absence of living things. He lay quietly, blending with sand, watching.

One of Gurney Halleck's tunes kept flowing through his mind, monotonously persistent:

"Beneath the hill where the fox
runs lightly,

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A dappled sun shines brightly
Where my one love's still.
Beneath the hill in the fennel brake
I spy my love who cannot wake.
He hides in a grave
Beneath the hill."

Where was the entrance to that place? Leto wondered.

He felt the certainty that this must be Jacurutu/Fondak, but there was something wrong here beyond the lack of animal movement. Something flickered at the edges of conscious perception, warning him.

What hid beneath the hill?

Lack of animals was bothersome. It aroused his Fremen sense of caution: *The absence says more than the presence when it comes to desert survival.*

But there was a windtrap. There would be water and humans to use it. This was the taboo place which hid behind Fondak's name, its other identity lost even to the memories of most Fremen. And no birds or animals could be seen there.

No humans, yet here the Golden Path began.

His father had once said: "There's unknown all around at every moment. That's where you seek knowledge."

Leto glanced out to his right along the dune crests. There'd been a mother storm recently. Lake Azrak, the gypsum plain, had been exposed from beneath its sandy cover. Fremen superstition said that whoever saw the Biyan, the White Lands, was granted a two-edged wish, a wish which might destroy you. Leto saw only a gypsum plain which told him that open water had existed once here on Arrakis.

As it would exist once more.

He peered upward, swinging his gaze all around in the search for movement. The sky was porous after the storm. Light passing through it generated a sensation of milky presence, of a silver sun lost somewhere above the dust veil which persisted in the high altitudes.

Once more, Leto brought his attention back to the sinuous rock. He slipped the binoculars from his Fremkit, focused their motile lenses and peered at the naked grayness, this outcropping where once the men of Jacurutu had lived. Amplification revealed a thorn bush, the one called Queen of Night. The bush nestled in shadows at a cleft which might be an entrance into the old sietch. He scanned the length of the outcropping. The silver sun turned reds into gray, casting a diffuse flatness over the long expanse of rock.

He rolled over, turning his back on Jacurutu, and scanned the circle of his surroundings through the binoculars. Nothing in that wilderness preserved the marks of human passage. The wind already had obliterated his tracks, leaving only a vague roundness where he had

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dropped from his worm in the night.

Again, he looked at Jacurutu. Except for the windtrap, there was no sign that men had ever passed this way. And without that sinuous length of rock, there was nothing here to subtract from the bleached sand, a wilderness from horizon to horizon.

Leto felt suddenly that he was in this place because he had refused to be confined in the system which his ancestors bequeathed him. He thought of how people looked at him, that universal mistake in every glance except Ghanima's.

Except for that ragged mob of other memories, this child was never a child.

I must accept responsibility for the decision we made, he thought.

Once more he scanned the length of rock. By all the descriptions this had to be Fondak, and no other place could be Jacurutu. He felt a strange resonant relationship with the taboo of this place. In the Bene Gesserit Way, he opened his mind to Jacurutu, seeking to know nothing about it. *Knowing* was a barrier which prevented learning. For a few moments, he allowed himself merely to resonate, making no demands, asking no questions.

The problem lay within the lack of animal life, but it was a particular thing which alerted him. He perceived it then: there were no scavenger birds—no eagles, no vultures, no hawks. Even when other life hid, these remained. Every watering place in this desert held its chain of life. At the end of the chain were the omnipresent scavengers. Nothing had come to investigate his presence. How well he knew the "watchdogs of the sietch," that line of crouched birds on the cliff's edge at Tabr, primitive undertakers waiting for flesh. As the Fremen said: "Our competitors." But they said it with no sense of jealousy because questing birds often told when strangers approached.

What if this Fondak has been abandoned even by the smugglers?

Leto paused to drink from one of his catchtubes.

What if there's truly no water here?

He reviewed his position. He'd run two worms into the sand getting here, riding them with his flail through the night, leaving them half dead. This was the Inner Desert where the smugglers' haven was to be found. If life existed here, if it *could* exist, it would have to be in the presence of water.

What if there's no water? What if this isn't Fondak/Jacurutu?

Once more, he aimed his binoculars at the windtrap. Its outer edges were sand-etched, in need of maintenance, but enough of it remained. There should be water.

But what if there isn't?

An abandoned sietch might lose its water to the air, to any number of catastrophes. Why were there no

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scavenger birds? Killed for their water? By whom? How could all of them be eliminated? Poison?

Poisoned water.

The legend of Jacurutu contained no story of the cistern poisoned, but it might have been. If the original flocks were slain, would they not have been renewed by this time? The Iduali were wiped out generations ago and the stories never mentioned poison. Again, he examined the rock with his binoculars. How could an entire sietch have been wiped out? Certainly, some must have escaped. All of the inhabitants of a sietch were seldom at home. Parties roamed the desert, trekked to the towns.

With a sigh of resignation, Leto put away his binoculars. He slipped down the hidden face of the dune, took extra care to dig in his stilltent and conceal all sign of his intrusion as he prepared to spend the hot hours. The sluggish currents of fatigue stole along his limbs as he sealed himself in the darkness. Within the tent's sweaty confines, he spent much of the day drowsing, imagining mistakes he could have made. His dreams were defensive, but there could be no self-defense in this trial he and Ghanima had chosen. Failure would scald their souls. He ate spice biscuits and slept, awakened to eat once more, to drink and return to sleep. It had been a long journey to this place, a severe test for the muscles of a child.

Toward evening, he awoke refreshed, listened for signs of life. He crept out of his sandy shroud. There was dust high in the sky blowing one way, but he could feel sand stinging his cheek from another direction—sure sign there would be a weather change. He sensed a storm coming.

Cautiously, he crept to the crest of his dune, peered once more at those enigmatic rocks. The intervening air was yellow. The signs spoke of a coriolis storm approaching, the wind that carried death in its belly. There'd be a great winding sheet of wind-driven sand that might stretch across four degrees of latitude. The desolate emptiness of the gypsum pan was a yellow surface now, reflecting the dust clouds. The false peace of evening enfolded him. Then the day collapsed and it was night, the quick night of the Inner Desert. The rocks were transformed into angular peaks frosted by the light of First Moon. He felt sandthorns stinging his skin. A peal of dry thunder sounded like an echo from distant drumsand and, in the space between moonlight and darkness he saw sudden movement: bats. He heard the shirring of their wings then, their tiny squeaks.

Bats.

By design or accident, this place conveyed a sense of abandoned desolation. It was where the half-legendary smuggler stronghold should be: Fondak. But what if it were

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not Fondak? What if the taboo still ruled and this were only the shell of ghostly Jacurutu?

Leto crouched in the lee of his dune and waited for the night to settle into its own rhythms. Patience and caution–caution and patience. For a time, he amused himself by reviewing Chaucer's route from London to Canterbury, listing the places from Southwark: Two miles to the Watering-place of St. Thomas, five miles to Deptford, six miles to Greenwich, thirty miles to Rochester, forty miles to Sittingbourne, fifty-five miles to Boughton under Blean, fifty-eight miles to Harbledown, and sixty miles to Canterbury. It gave him a sense of timeless buoyancy to know that few in his universe would recall Chaucer or know any London except the village on Gansireed. St. Thomas was preserved in the Orange Catholic Bible and the Azhar Book, but Canterbury was gone from the memories of men, as was the planet which had known it. There lay the burden of his memories, of all those lives which threatened to engulf him. He had made that trip to Canterbury once.

His present trip was longer, though, and more dangerous.

Presently, he crept over the dune's crest and made his way toward the moonlit rocks. He blended with shadows, slid across the crests, made no sounds that might signal his presence.

The dust had gone as it often did just before a storm, and the night was brilliant. The day had revealed no movement, but he heard small creatures hustling in the darkness as he neared the rocks.

In a valley between two dunes, he came upon a family of jerboa which scampered away at his approach. He eased over the next crest, his emotions beset by salty anxieties. That cleft he had seen–did it lead up to an entrance? And there were other concerns: the old-time sietch had always been guarded by traps–poisoned barbs in pits, poisoned spines on plants. He felt himself caught up in the Fremen agrapha: *The ear-minded night.* And he listened for the slightest sound.

The gray rocks towered above him now, made giant by his nearness. As he listened, he heard birds invisible in that cliff, the soft calling of winged prey. They were the sounds of daybirds, but abroad by night. What had turned their world around? Human predation?

Abruptly, Leto froze against the sand. There was fire on the cliff, a ballet of glittering and mysterious gems against the night's black gauze, the sort of signal a sietch might send to wanderers across the bled. Who were these occupants of this place? He crept forward into the deepest shadows at the cliff's base, felt along the rock with a hand, sliding his body behind the hand as he sought the fissure he'd seen by daylight. He located it on

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his eighth step, slipped the sand-snorkel from his kit and probed the darkness. As he moved, something tight and binding dropped over his shoulders and arms, immobilizing him.

Trapvine!

He resisted the urge to struggle; that only made the vine pull tighter. He dropped the snorkel, flexed the fingers of his right hand, trying for the knife at his waist. He felt like a bare innocent for not throwing something into that fissure from a distance, testing the darkness for its dangers. His mind had been too occupied by the fire on the cliff.

Each movement tightened the trapvine, but his fingers at last touched the knife hilt. Stealthily, he closed his hand around the hilt, began to slip it free.

Flaring light enveloped him, arresting all movement.

"Ahhh, a fine catch in our net." It was a heavy masculine voice from behind Leto, something vaguely familiar in the tone. Leto tried to turn his head; aware of the vine's dangerous propensity to crush a body which moved too freely.

A hand took his knife before he could see his captor. The hand moved expertly over his body, extracting the small devices he and Ghanima carried as a matter of survival. Nothing escaped the searcher, not even the shigawire garrote concealed in his hair.

Leto still had not seen the man.

Fingers did something with the trapvine and he found he could breathe easier, but the man said: "Do not struggle, Leto Atreides. I have your water in my cup."

By supreme effort, Leto remained calm, said: "You know my name?"

"Of course! When one baits a trap, it's for a purpose. One aims for a specific quarry, not so?"

Leto remained silent, but his thoughts whirled.

"You feel betrayed!" the heavy voice said. Hands turned him around, gently but with an obvious show of strength. An adult male was telling the child what the odds were.

Leto stared up into the glare from twin floater flares, saw the black outline of a stillsuit-masked face, the hood. As his eyes adjusted, he made out a dark strip of skin, the utterly shadowed eyes of melange addiction.

"You wonder why we went to all this trouble," the man said. His voice issued from the shielded lower part of his face with a curious muffled quality as though he tried to conceal an accent.

"I long ago ceased to wonder at the numbers of people who want the Atreides twins dead," Leto said. "Their reasons are obvious."

As he spoke, Leto's mind flung itself against the unknown as against a cage, questing wildly for answers. A baited trap? But who

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had known except Ghanima? Impossible! Ghanima wouldn't betray her own brother. Then did someone know him well enough to predict his actions? Who? His grandmother? How could she?

"You could not be permitted to go on as you were," the man said. "Very bad. Before ascending the throne, you need to be educated." The whiteless eyes stared down at him. "You wonder how one could presume to educate such a person as yourself? You, with the knowledge of a multitude held there in your memories? That's just it, you see! You think yourself educated, but all you are is a repository of dead lives. You don't yet have a life of your own. You're just a walking surfeit of others, all with one goal—to seek death. Not good in a ruler, being a death-seeker. You'd strew your surroundings with corpses. Your father, for example, never understood the . . ."

"You dare speak of him that way?"

"Many's the time I've dared it. He was only Paul Atreides, after all. Well, boy, welcome to your school."

The man brought a hand from beneath his robe, touched Leto's cheek. Leto felt the jolt of a slapshot and found himself winding downward into a darkness where a green flag waved. It was the green banner of the Atreides with its day and night symbols, its Dune staff which concealed a water tube. He heard the water gurgling as unconsciousness enfolded him. Or was it someone chuckling?

We can still remember the golden days before Heisenberg, who showed humans the walls enclosing our predestined arguments. The lives within me find this amusing. Knowledge, you see, has no uses without purpose, but purpose is what builds enclosing walls.

—Leto Atreides II
His Voice

Alia found herself speaking harshly to the guards she confronted in the Temple foyer. There were nine of them in the dusty green uniforms of the suburban patrol, and they were still panting and sweating with their exertions. The light of late afternoon came in the door behind them. The area had been cleared of pilgrims.

"So my orders mean nothing to you?" she demanded.

And she wondered at her own anger, not trying to contain it, but letting it run. Her body trembled with unleashed tensions. Idaho gone . . . the Lady Jessica . . . no reports . . . only rumors that they were on Salusa. Why hadn't Idaho sent a message? What had he done? Had he learned finally about Javid?

Alia wore the yellow of Arrakeen mourning, the color of the burning sun from Fremen history. In a few minutes, she would be leading the second and final funeral procession

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to Old Gap, there to complete the stone marker for her lost nephew. The work would be completed in the night, fitting homage to one who'd been destined to lead Fremen.

The priestly guards appeared defiant in the face of her anger, not shamed at all. They stood in front of her, outlined by the waning light. The odor of their perspiration was easily detected through the light and inefficient stillsuits of city dwellers. Their leader, a tall blond Kaza with the bourka symbols of the Cadelam family, flung his stillsuit mask aside to speak more clearly. His voice was full of the prideful intonations to be expected from a scion of the family which once had ruled at Sietch Abbir.

"Certainly we tried to capture him!"

The man was obviously outraged at her attack. "He speaks blasphemy! We know your orders, but we heard him with our own ears!"

"And you failed to catch him," Alia said, her voice low and accusing.

One of the other guards, a short young woman, tried to defend them. "The crowds were thick there! I swear people interfered with us!"

"We'll keep after him," the Cadelam said. "We'll not always fail."

Alia scowled. "Why won't you understand and obey me?"

"My Lady, we . . ."

"What will you do, scion of the *Cade Lamb,* if you capture him and find him to be, in truth, my brother?"

He obviously did not hear her special emphasis on his name, although he could not be a priestly guard without some education and the wit to go with it. Did he want to sacrifice himself?

The guardsman swallowed, then: "We must kill him ourselves, for he breeds disorder."

The others stood aghast at this, but still defiant. They knew what they had heard.

"He calls upon the tribes to band against you," the Cadelam said.

Alia knew how to handle him now. She spoke quietly, matter of fact: "I see. Then if you must sacrifice yourself this way, taking him openly for all to see who you are and what you do, then I guess you must."

"Sacrifice my . . ." He broke off, glanced at his companions. As Kaza of this group, their appointed leader, he had the right to speak for them, but he showed signs that he wished he'd remained silent. The other guards stirred uncomfortably. In the heat of the chase, they'd defied Alia. One could only reflect now upon such defiance of *The Womb of Heaven.* With obvious discomfort, the guards opened a small space between themselves and their Kaza.

"For the good of the church, our official reaction would have to be

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severe," Alia said. "You understand that, don't you?"

"But he . . ."

"I've heard him myself," she said. "But this is a special case."

"He cannot be Muad'Dib, My Lady!"

How little you know! she thought. She said: "We cannot risk taking him in the open, harming him where others could see it. If another opportunity presents itself, of course."

"He's always surrounded by crowds these days!"

"Then I fear you must be patient. Of course, if you insist on defying me . . ." She left the consequences hanging in the air, unspoken, but well understood. The Cadelam was ambitious, a shining career before him.

"We didn't mean defiance, My Lady." The man had himself under control now. "We acted hastily; I can see that. Forgive us, but . . ."

"Nothing has happened; nothing to forgive," she said, using the common Fremen formula. It was one of the many ways a tribe kept peace in its ranks and this Cadelam was still old Fremen enough to remember that. His family carried a long tradition of leadership. Guilt was the Naib's whip, to be used sparingly. Fremen served best when free of guilt or resentment.

He showed his realization of her judgment by bowing his head, saying: "For the good of the tribe; I understand."

"Go refresh yourselves," she said. "The procession begins in a few minutes."

"Yes, My Lady." They bustled away, every movement revealing their relief at this escape.

Within Alia's head, a bass voice rumbled: "Ahhhhh, you handled that most adroitly. One or two of them still believe you desire The Preacher dead. They'll find a way."

"Shut up!" she hissed. "Shut up! I should never have listened to you! Look what you've done . . ."

"Set you on the road to immortality," the bass voice said.

She felt it echoing in her skull like a distant ache, thought: *Where can I hide? There's no place to go!*

"Ghanima's knife is sharp," the Baron said. "Remember that."

Alia blinked. Yes, that was something to remember. Ghanima's knife was sharp. That knife might yet cut them out of their present predicament.

If you believe certain words, you believe their hidden arguments. When you believe something is right or wrong, true or false, you believe the assumptions in the words which express the arguments. Such assumptions are often full of holes, but remain most precious to the convinced.

—The Open-Ended Proof
from The Panoplia Prophetica

Leto's mind floated in a stew of fierce odors. He recognized the heavy cinnamon of melange, the

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confined sweat of working bodies, the acridity of an uncapped deathstill, dust of many sorts, but flint was dominant. The odors formed a trail through dreamsand, created shapes of fog in a dead land. He knew these odors should tell him something, but part of him could not yet listen.

Thoughts like wraiths floated through his mind: *In this time, I have no finished features; I am all of my ancestors. The sun setting into the sand is the sun setting into my soul. Once, this multitude within me was great, but that's ended. I'm Fremen and I'll have a Fremen ending. The Golden Path is ended before it began. It's nothing but a wind-blown trail. We Fremen knew all the tricks to conceal ourselves: we left no feces, no water, no tracks . . . Now, look at my trail vanish.*

A masculine voice spoke close to his ear: "I could kill you, Atreides. I could kill you, Atreides." It was repeated over and over until it lost meaning, became a wordless thing carried within Leto's dreaming, a litany of sorts: "I could kill you, Atreides."

Leto cleared his throat and felt the reality of this simple act shake his senses. His dry throat managed: "Who . . ."

The voice beside him said: "I'm an educated Fremen and I've killed my man. You took away our gods, Atreides. What do we care about your stinking Muad'Dib? Your god's dead!"

Was that a real Ouraba voice or another part of his dream? Leto opened his eyes, found himself unfettered on a hard couch. He looked upward at rock, dim glowglobes, an unmasked face staring down at him so close he could smell the breath with its familiar odors of a sietch diet. The face was Fremen: no mistaking the dark skin, those sharp features and water-wasted flesh. This was no fat city-dweller. Here was a desert Fremen.

"I am Namri, father of Javid," the Fremen said. "Do you know me now, Atreides?"

"I know Javid," Leto husked.

"Yes, your family knows my son well. I am proud of him. You Atreides may know him even better soon."

"What . . ."

"I am one of your schoolmasters, Atreides. I have only one function: I am the one who could kill you. I'd do it gladly. In this school, to graduate is to live; to fail is to be given into my hands."

Leto heard implacable sincerity in that voice. It chilled him. This was a human *gom jabbar*, a high-handed enemy to test his right of entrance into the human concourse. Leto sensed his grandmother's hand in this and, behind her, the faceless masses of the Bene Gesserit. He writhed at this thought.

"Your education begins with me," Namri said. "That is just. It is fitting. Because it could end with

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me. Listen to me carefully now. My every word carries your life in it. Everything about me holds your death within it."

Leto shot his glance around the room: rock walls, barren—only this couch, the dim glowglobes and a dark passage behind Namri.

"You will not get past me," Namri said. And Leto believed him.

"Why're you doing this?" Leto asked.

"That's already been explained. Think what plans are in your head! You are here and you cannot put a future into your present condition. The two don't go together: now and future. But if you really know your past, if you look backward and see where you've been, perhaps there'll be reason once more. If not, there will be your death."

Leto noted that Namri's tone was not unkind, but it was firm and no denying the death in it.

Namri rocked back on his heels, stared at the rock ceiling. "In olden times Fremen faced east at dawn. *Eos*, you know? That's dawn in one of the old tongues."

Bitter pride in his voice, Leto said: "I speak that tongue."

"You have not listened to me, then," Namri said, and there was a knife edge in his voice. "Night was the time of chaos. Day was the time of order. That's how it was in the time of that tongue you say you speak: darkness-disorder, light-order. We Fremen changed that. Eos was the light we distrusted. We preferred the light of a moon, or the stars. Light was too much order and that can be fatal. You see what you Eos-Atreides have done? Man is a creature of only that light which protects him. The sun was our enemy on Dune." Namri brought his gaze down to Leto's level. "What light do you prefer, Atreides?"

By Namri's poised attitude, Leto sensed that this question carried deep weight. Would the man kill him if he failed to answer correctly? He might. Leto saw Namri's hand resting quietly next to the polished hilt of a crysknife. A ring in the form of a magic tortoise glittered on the Fremen's knife hand.

Leto eased himself up onto his elbows, sent his mind questing into Fremen beliefs. They trusted the Law and loved to hear its lessons expounded in analogy, these old Fremen. The light of the moon?

"I prefer . . . the light of Lisanu L'haqq," Leto said, watching Namri for subtle revelations. The man seemed disappointed, but his hand moved away from his knife. "It is the light of truth, the light of the perfect man in which the influence of al-Mutakallim can clearly be seen," Leto continued. "What other light would a human prefer?"

"You speak as one who recites, not one who believes," Namri said.

And Leto thought: *I did recite.* But he began to sense the drift of

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Namri's thoughts, how his words were filtered through early training in the ancient riddle game. Thousands of these riddles went into Fremen training, and Leto had but to bend his attention upon this custom to find examples flooding his mind. *"Challenge: Silence? Answer: The friend of the hunted."*

Namri nodded to himself as though he shared this thought, said: "There is a cave which is the cave of life for Fremen. It is an actual cave which the desert has hidden. Shai Hulud, the great grandfather of all Fremen, sealed up that cave. My Uncle Ziamad told me about it and he never lied to me. There is such a cave."

Leto heard the challenging silence when Namri finished speaking. *Cave of life?* "My Uncle Stilgar also told me of that cave," Leto said. "It was sealed to keep cowards from hiding there."

The reflection of a glowglobe glittered in Namri's shadowed eyes. He asked: "Would you Atreides open that cave? You seek to control life through a ministry: your Central Ministry for Information, Auquaf and Hajj. The Maulana in charge is called Kausar. He has come a long way from his family's beginnings at the salt mines of Niazi. Tell me, Atreides, what is wrong with your ministry?"

Leto sat up, aware now that he was fully into the riddle game with Namri and that the forfeit was death. The man gave every indication that he'd use that crysknife at the first wrong answer.

Namri, recognizing this awareness in Leto, said: "Believe me, Atreides. I am the clod-crusher. I am the iron hammer."

Now, Leto understood. Namri saw himself as Mirzabah, the Iron Hammer with which the dead are beaten who cannot reply satisfactorily to the questions they must answer before entry into paradise.

What was wrong with the central ministry which Alia and her priests had created?

Leto thought of why he'd come into the desert and a small hope returned to him that the Golden Path might yet appear in his universe. What this Namri implied by his question was no more than the motive which had driven Muad'Dib's own son into the desert.

"God's it is to show the way," Leto said.

Namri's chin jerked down and he stared sharply at Leto. "Can it be true that you believe this?" he demanded.

"It's why I am here," Leto said.

"To find the way?"

"To find it for myself." Leto put his feet over the edge of the cot. The rock floor was uncarpeted, cold. "The priests created their ministry to hide the way."

"You speak like a true rebel," Namri said, and he rubbed the tortoise ring on his finger. "We shall see. Listen carefully once more.

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You know the high Shield Wall at Jalal-ud-Din? That Wall bears my family's marks carved there in the first days. Javid, my son, has seen those marks. Abedi Jalal, my nephew, has seen them. Mujahid Shafquat of the Other Ones, he too has seen our marks. In the season of the storms near Sukkar, I came down with my friend Yakup Abad near that place. The winds were blistering hot like the whirlwinds from which we learned our dances. We did not take time to see the marks because a storm blocked the way. But when the storm passed we saw the vision of Thatta upon the blown sand. The face of Shakir Ali was there for a moment looking down upon his city of tombs. The vision was gone in the instant, but we all saw it. Tell me, Atreides, where can I find that city of tombs?"

The whirlwinds from which we learned our dances. Leto thought. *The vision of Thatta and Shakir Ali.* These were the words of a Zensunni Wanderer, those who considered themselves to be the only true men of the desert.

And Fremen were forbidden to have tombs.

"The city of tombs is at the end of the path which all men follow," Leto said. And he dredged up the Zensunni beatifics. "It is in a garden one thousand paces square. There is a fine entry corridor two hundred and thirty-three paces long and one hundred paces wide all paved with marble from ancient Jaipur. Therein dwells ar-Razzaq, he who provides food for all who ask. And on the Day of Reckoning, all who stand up and seek the city of tombs shall not find it. For it is written: That which you know in one world, you shall not find in another."

"Again, you recite without belief," Namri sneered. "But I'll accept it for now because I think you know why you're here." A cold smile touched his lips. "I give you a *provisional* future, Atreides."

Leto studied the man warily. Was this another question in disguise?

"Good!" Namri said. "Your awareness has been prepared. I've sunk home the barbs. One more thing, then. Have you heard that they wear imitation stillsuits in the cities of far Kadrish?"

As Namri waited, Leto quested in his mind for a hidden meaning. *Imitation stillsuits? They were worn on many planets.* He said: "The foppish habits of Kadrish are an old story often repeated. The wise animal blends into its surroundings."

Namri nodded slowly, then: "The one who trapped you and brought you here will see you presently. Do not try to leave this place. It would be your death." Arising as he spoke, Namri went out into the dark passage.

For a long time after he had gone, Leto stared into the passage.

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He could hear sounds out there, the quiet voices of men on guard duty. Namri's story of the mirage-vision stayed with Leto. It brought up the long desert crossing to this place. It no longer mattered whether this were Jacurutu/Fondak. Namri was not a smuggler. He was something much more potent. And the game Namri played smelled of the Lady Jessica; it stank of the Bene Gesserit. Leto sensed an enclosing peril in this realization. But that dark passage where Namri had gone was the only exit from this room. And outside lay a strange sietch—beyond that, the desert. The harsh severity of that desert, its ordered chaos with mirages and endless dunes, came over Leto as part of the trap in which he was caught. He could re-cross that sand, but where would flight take him? The thought was like stagnant water. It would not quench his thirst.

Because of the one-pointed Time awareness in which the conventional mind remains immersed, humans tend to think of everything in a sequential, word-oriented framework. This mental trap produces very short-term concepts of effectiveness and consequences, a condition of constant, unplanned response to crises.

—Liet-Kynes
The Arrakis Workbook

Words and movements simultaneous, Jessica reminded herself, and she bent her thoughts to those necessary mental preparations for the coming encounter.

The hour was shortly after breakfast, the golden sun of Salusa Secundus just beginning to touch the far wall of the enclosed garden which she could see from her window. She had dressed herself carefully: the black hooded cloak of a Reverend Mother, but it carried the Atreides crest in gold worked into an embroidered ring around the hem and again at the cuff of each sleeve. Jessica arranged the drape of her garment carefully as she turned her back on the window, holding her left arm across her waist to present the hawk motif of the crest.

Farad'n noted the Atreides symbols, commenting on them as he entered, but he betrayed no anger or surprise. She detected subtle humor in his voice and wondered at it. She saw that he had clad himself in the gray leotard which she had suggested. He sat on the low green divan to which she directed him, relaxing with his right arm along the back.

Why do I trust her? he wondered. *This is a Bene Gesserit witch!*

Jessica, reading the thought in the contrast between his relaxed body and the expression on his face, smiled and said: "You trust me because you know our bargain is a good one, and you want what I can teach you."

She saw the pinch of a scowl

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touch his brow, waved her left hand to calm him. "No, I don't read minds. I read the face, the body, the mannerisms, tone of voice, set of arms. Anyone can do this once they learn the Bene Gesserit Way."

"And you will teach me?"

"I'm sure you've studied the reports about us," she said. "Is there anywhere a report that we fail to deliver on a direct promise?"

"No reports, but . . ."

"We survive in part by the complete confidence which people can have in our truthfulness. That has not changed."

"I find this reasonable," he said. "I'm anxious to begin."

"I'm surprised you've never asked the Bene Gesserit for a teacher," she said. "They would've leaped at the opportunity to put you in their debt."

"My mother would never listen to me when I urged her to do this," he said. "But now . . ." He shrugged, an eloquent comment on Wensicia's banishment. "Shall we start?"

"It would've been better to begin this when you were much younger," Jessica said. "It'll be harder for you now, and it'll take much longer. You'll have to begin by learning patience, extreme patience. I pray you'll not find it too high a price."

"Not for the reward you offer."

She heard the sincerity, the pressure of expectations and the touch of awe in his voice. These formed a place to begin. She said: "The art of patience, then—starting with some elementary prana-bindu exercises for the legs and arms, for your breathing. We'll leave the hands and fingers for later. Are you ready?"

She seated herself on a stool facing him.

Farad'n nodded, holding an expectant expression on his face to conceal the sudden onset of fear. Tyekanik had warned him that there must be a trick in the Lady Jessica's offer, something brewed by the Sisterhood. "You cannot believe that she has abandoned them again or that they have abandoned her." Farad'n had stopped the argument with an angry outburst for which he'd been immediately sorry. His emotional reaction had made him agree more quickly with Tyekanik's precautions. Farad'n glanced at the corners of the room, the subtle gleam of gems in the coving. All that glittered was not gems: everything in this room would be recorded and good minds would review every nuance, every word, every movement.

Jessica smiled, noting the direction of his gaze, but not revealing that she knew where his attention had wandered. She said: "To learn patience in the Bene Gesserit Way, you must begin by recognizing the essential, raw instability of our universe. We call Nature, meaning this totality in all of its manifestations, the Ultimate Nonabsolute. To free

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your vision and permit you to recognize this conditional Nature's changing ways, you will hold your two hands at arm's-length in front of you. Stare at your extended hands, first the palms and then the backs. Examine the fingers, front and back. Do it."

Farad'n complied, but he felt foolish. These were his own hands. He knew them.

"Imagine your hands aging," Jessica said. "They must grow very old in your eyes. Very, very old. Notice how dry the skin . . ."

"My hands don't change," he said. He already could feel the muscles of his upper arms trembling.

"Continue to stare at your hands. Make them old, as old as you can imagine. It may take time. But when you see them age, reverse the process. Make your hands young again—as young as you can make them. Strive to take them from infancy to great age at will, back and forth, back and forth."

"They don't change!" he protested. His shoulders ached.

"If you demand it of your senses, your hands will change," she said. "Concentrate upon visualizing the flow of time which you desire: infancy to age, age to infancy. It may take you hours, days, months. But it can be achieved. Reversing that change-flow will teach you to see every system as something spinning in relative stability . . . only relative."

"I thought I was learning patience." She heard anger in his voice, an edge of frustration.

"And relative stability," she said. "This is the perspective which you create with your own beliefs and beliefs can be manipulated by imagination. You've learned only a limited way of looking at the universe. Now, you must make the universe your own creation. This will permit you to harness any relative stability to your own uses, to whatever uses you are capable of imagining."

"How long did you say it takes?"

"Patience," she reminded him.

A spontaneous grin touched his lips. His eyes wavered toward her.

"Look at your hands!" she snapped.

The grin vanished. His gaze jerked back to a fixated concentration upon his extended hands.

"What do I do when my arms get tired?" he asked.

"Stop talking and concentrate," she said. "If you become too tired, stop. Return to it after a few minutes of relaxation and exercise. You must persist in this until you succeed. At your present stage, this is more important than you could possibly realize. Learn this lesson or the others will not come."

Farad'n inhaled a deep breath, chewed his lips, stared at his hands. He turned them slowly: front, back, front, back . . . His shoulders trembled with fatigue. Front, back . . . Nothing changed.

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Jessica arose, crossed to the only door.

He spoke without removing his attention from his hands. "Where are you going?"

"You'll work better on this if you're alone. I'll return in about an hour. Patience."

"I know!"

She studied him a moment. How intent he looked. He reminded her with a heart-tugging abruptness of her own lost son. She permitted herself a sigh, said: "When I return, I'll give you the exercise lessons to relieve your muscles. Give it time. You'll be astonished at what you can make your body and your senses do."

She let herself out.

The omnipresent guards took up station three paces behind her as she strode down the hall. Their awe and fear were obvious. They were Sardaukar, thrice-warned of her prowess, raised on the stories of their defeat by the Fremen of Arrakis. This witch was a Fremen Reverend Mother, a Bene Gesserit and an Atreides.

Jessica, glancing back, saw their stern faces as a milepost in her design. She turned away as she came to the stairs, went down them and through a short passage into the garden below her windows.

Now, if only Duncan and Gurney can do their parts, she thought as she felt the gravel of a pathway beneath her feet, saw the golden light filtered by greenery.

You will learn the integrated communication methods as you complete the next step in your mentat education. This is a gestalten function which will overlay data paths in your awareness, resolving complexities and masses of input from the mentat index-catalog techniques which you already have mastered. Your initial problem will be the breaking tensions arising from the divergent assembly of minutiae/data on specialized subjects. Be warned. Without mentat overlay integration, you can be immersed in the Babel Problem, which is the label we give to the omnipresent dangers of achieving wrong combinations from accurate information.

—The Mentat Handbook

The sound of fabrics rubbing together sent sparks of awareness through Leto. He was surprised that he had tuned his sensitivity to the point where he automatically identified the fabrics from their sound: the combination came from a Fremen robe rubbing against the coarse hangings of a door curtain. He turned toward the sound. It came from the passage where Namri had gone minutes before. As Leto turned, he saw his captor enter. It was the same man who had taken him prisoner: the same dark strip of skin above the stillsuit mask, the identical searing eyes. The man lifted a hand to his mask, slipped the catchtube from his nos-

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trils, lowered the mask and, in the same motion, flipped his hood back. Even before he focused on the scar of the inkvine whip along the man's jaw, Leto recognized him. The recognition was a totality in his awareness with the search for confirming details coming afterward. No mistake about it, this rolling lump of humanity, this warrior-troubadour, was Gurney Halleck!

Leto clenched his hands into fists, overcome momentarily by the shock of recognition. No Atreides retainer had ever been more loyal. None better at shield fighting. He'd been Paul's trusted confidant and teacher.

He was the Lady Jessica's servant.

These recognitions and more surged through Leto's mind. Gurney was his captor. Gurney and Namri were in this conspiracy together. And Jessica's hand was in it with them.

"I understand you've met our Namri," Halleck said. "Pray believe him, young sir. He has one function and one function only. He's the one capable of killing you should the need arise."

Leto responded automatically with his father's tones: "So you've joined my enemies, Gurney! I never thought the . . ."

"Try none of your devil tricks on me, lad," Halleck said. "I'm proof against them all. I follow your grandmother's orders. Your education has been planned to the last detail. It was she who approved my selection of Namri. What comes next, painful as it may seem, is at her command."

"And what does she command?"

Halleck lifted a hand from the folds of his robe, exposed a Fremen injector, primitive but efficient. Its transparent tube was charged with blue fluid.

Leto squirmed backward on the cot, was stopped by the rock wall. As he moved, Namri entered, stood beside Halleck with hand on crysknife. Together, they blocked the only exit.

"I see you've recognized the spice essence," Halleck said. "You're to take the *worm trip,* lad. You must go through it. Otherwise, what your father dared and you dare not would hang over you for the rest of your days."

Leto shook his head wordlessly. This was the thing he and Ghanima knew could overwhelm them. Gurney was an ignorant fool! How could Jessica . . . Leto felt the father-presence in his memories. It surged into his mind, trying to strip away his defenses. Leto wanted to shriek outrage, could not move his lips. But this was the wordless thing which his pre-born awareness most feared. This was prescient trance, the reading of immutable future with all of its fixity and its terrors. Surely, Jessica could not have ordered such an ordeal for her own grandson. But her pres-

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ence loomed in his mind, filling him with acceptance arguments. Even the litany of fear was pressed upon him with a repetitive droning: *"I must not fear. Fear is the mind-killer. Fear is the little death that brings total obliteration. I will face my fear. I will permit it to pass over me and through me. And when it has gone past . . ."*

With an oath already ancient when Chaldea was young, Leto tried to move, tried to leap at the two men standing over him, but his muscles refused to obey. As though he already existed in the trance, Leto saw Halleck's hand move, the injector approach. The light of a glowglobe sparkled within the blue fluid. The injector touched Leto's left arm. Pain lanced through him, shot upward to the muscles of his neck, into his head.

Abruptly, Leto saw a young woman sitting outside a crude hut in dawnlight. She sat right there in front of him roasting coffee beans to a rose-brown, adding cardomam and melange. The voice of a rebeck echoed from somewhere behind him. The music echoed and echoed until it entered his head, still echoing. It suffused his body and he felt himself to be large, very large, not a child at all. And his skin was not his own. He knew that sensation! His skin was not his own.

Warmth spread through his body. As abruptly as his first vision, he found himself standing in darkness. It was night. Stars like a rain of embers fell in gusts from a brilliant cosmos.

Part of him knew there was no escaping, but still he tried to fight it until the father-presence intruded. "I will protect you in the trance. The others within will not take you."

Wind tumbled Leto, rolled him, hissing, pouring dust and sand over him, cutting his arms, his face, abrading his clothes, whipping the loose-torn ends of now useless fabric. But he felt no pain and he saw the cuts heal as rapidly as they appeared. Still, he rolled with the wind. And his skin was not his own.

It will happen! he thought.

But the thought was distant and came as though it were not his own, not really his own; no more his own than his skin.

The vision absorbed him. It evolved into a stereologic memory which separated past and present, future and present, future and past. Each separation mingled into a trinocular focus which he sensed as the multidimensional relief map of his own future existence.

He thought: *Time is a measure of space, just as a range-finder is a measure of space, but measuring locks us into the place we measure.*

He sensed the trance deepening. It came as an amplification of internal consciousness which his self-identity soaked up and through which he felt himself changing. It

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was Living Time and he could not arrest an instant of it. Memory fragments, future and past, deluged him. But they existed as montage-in-motion. Their relationships underwent a constant dance. His memory was a lens, an illuminating searchlight which picked out fragments, isolating them, but forever failing to stop the ceaseless motion and modification which surged into his view.

That which he and Ghanima had planned came through the searchlight, dominating everything, but now it terrified him. Vision reality ached in him. The uncritical inevitability made his ego cringe.

And his skin was not his own!

Past and present tumbled through him, surging across the barriers of his terror. He could not separate them. One moment, he felt himself setting forth on the Butlerian Jihad, eager to destroy any machine which simulated human awareness. That had to be the past—over and done with. Yet his senses hurtled through the experience, absorbing the most minute details. He heard a minister-companion speaking from a pulpit: *"We must negate the machines-that-think. Humans must set their own guidelines. This is not something machines can do. Reasoning depends upon programming, not on hardware, and we are the ultimate program!"*

He heard the voice clearly, knew his surroundings—a vast wooden hall with dark windows. Light came from sputtering flames. And his minister-companion said: *"Our Jihad is a 'dump program.' We dump the things which destroy us as humans!"*

And it was in Leto's mind that the speaker had been a servant of computers, one who knew them and serviced them. But the scene vanished and Ghanima stood in front of him, saying: *"Gurney knows. He told me. They're Duncan's words and Duncan was speaking as a mentat. 'In doing good, avoid notoriety; in doing evil, avoid self-awareness.'"*

That had to be future—far future. But he felt the reality. It was as intense as any past from his multitude of lives. And he whispered: "Isn't that true, Father?"

But the father-presence within spoke warningly: *"Don't invite disaster! You're learning stroboscopic awareness now. Without it, you could overrun yourself, lose your place-mark in Time."*

And the bas-relief imagery persisted. Intrusions hammered at him. Past-present-now. There was no true separation. He knew he had to flow with this thing, but the flowing terrified him. How could he return to any recognizable place? Yet, he felt himself being forced to cease every effort of resistance. He could not grasp his new universe in motionless, labeled bits. No bit would stand still. Things could not be forever ordered and formulated.

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He had to find the rhythm of change and see between the changes to the changing itself. Without knowing where it began, he found himself moving within a gigantic *Moment Bienheureux,* able to see the past in the future, present in past, the *now* in both past and future. It was the accumulation of centuries experienced between one heartbeat and the next.

Leto's awareness floated free, no objective psyche to compensate for consciousness, no barriers. Namri's 'provisional future' remained lightly in his memory, but it shared awareness with many futures. And, in this shattering awareness, all of his past, every inner life became his own. With the help of the greatest within him, he dominated. They were *his.*

He thought: *When you study an object from a distance, only its principle may be seen.* He had achieved the distance and he could see his own life now: the multi-past and its memories were his burden, his joy and his necessity. But the *worm trip* had added another dimension and his father no longer stood guard within him because the need no longer existed. Leto saw through the distances clearly—past and present. And the past presented him with an ultimate ancestor who was called Harum and without whom the distant future would not be. These clear distances provided new principles, new dimensions of sharing. Whichever life he now chose, he'd live it out in an autonomous sphere of mass experience, a trail of lives so convoluted that no single lifetime could count the generations of it. Aroused, this mass experience held the power to subdue his selfdom. It could make itself felt upon an individual, a nation, a society or an entire civilization. That, of course, was why Gurney had been taught to fear him; why Namri's knife waited. They could not be allowed to see this power within him. No one could ever see it in its fullness . . . not even Ghanima.

Presently, Leto sat up, and saw only Namri remained, watching.

In an old voice, Leto said: "There's no single set of limits for all men. Universal prescience is an empty myth. Only the most powerful local currents of Time may be foretold. But, in an infinite universe, *local* can be so gigantic that your mind shrinks from it."

Namri shook his head, not understanding.

"Where's Gurney?" Leto asked.

"He left lest he have to watch me slay you."

"Will you slay me, Namri?" It was almost a plea to have the man do it.

Namri took his hand from his knife. "Since you ask me to do it, I will not. If you were indifferent, though . . ."

"The malady of indifference is what destroys many things," Leto said. He nodded to himself. "Yes

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. . . even civilizations die of it. It's as though that were the price demanded for achieving new levels of complexity or consciousness." He looked up at Namri. "So they told you to look for indifference in me?" And he saw Namri was more than a killer—Namri was devious.

"As a sign of unbridled power," Namri said, but it was a lie.

"Indifferent power, yes." Leto sat up, sighed deeply. "There was no moral grandeur to my father's life, Namri; only a local trap which he built for himself."

O Paul, thou Muad'Dib,
Mahdi of all men,
Thy breath exhaled
Sent forth the huricen.

—Songs of Muad'Dib

"Never!" Ghanima said. "I'd kill him on our wedding night." She spoke with a barbed stubbornness which thus far had resisted all blandishments. Alia and her advisers had been at it half the night, keeping the royal quarters in a state of unrest, sending out for new advisers, for food and drink. The entire Temple and its adjoining Keep seethed with the frustrations of unmade decisions.

Ghanima sat composedly on a green floater chair in her own quarters, a large room with rough tan walls to simulate sietch rock. The ceiling, however, was imbar crystal which flickered with blue light, and the floor was black tile. The furnishings were sparse, a small writing table, five floater chairs and a narrow cot set into an alcove, Fremen fashion. Ghanima wore a robe of yellow mourning.

"You are not a free person who can settle every aspect of her own life," Alia said for perhaps the hundredth time. *This little fool must come to realize that sooner or later! She must approve the betrothal to Farad'n. She must! Let her kill him later, but the betrothal requires open acknowledgement by the Fremen affianced.*

"He killed my brother," Ghanima said, holding to the single note which sustained her. "Everyone knows this. Fremen would spit at the mention of my name were I to consent to this betrothal."

And that is one of the reasons why you must consent, Alia thought. She said: "His mother did it. He has banished her for it. What more do you want of him?"

"His blood," Ghanima said. "He's a Corrino."

"He has denounced his own mother," Alia protested. "And why should you worry about the Fremen rabble? They'll accept whatever we tell them to accept. Ghani, the peace of the Empire demands that . . ."

"I will not consent," Ghanima said. "You cannot announce the betrothal without me."

Irulan, entering the room as Ghanima spoke, glanced inquiringly at Alia and the two female advisers who stood dejectedly

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beside her. Irulan saw Alia throw up her arms in disgust and drop into a chair facing Ghanima.

"You speak to her, Irulan," Alia said.

Irulan pulled a floater into place, sat down beside Alia.

"You're a Corrino, Irulan," Ghanima said. "Don't press your luck with me." Ghanima got up, crossed to her cot and sat on it cross-legged, glaring back at the women. Irulan, she saw, had dressed in a black aba to match Alia's, the hood thrown back to reveal her golden hair. It was mourning hair under the yellow glow of the floating globes which illuminated the room.

Irulan glanced at Alia, stood up and crossed to stand facing Ghanima. "Ghani, I'd kill him myself if that were the way to solve matters. And Farad'n's my own blood as you so kindly emphasized. But you have duties far higher than your commitment to Fremen . . ."

"That doesn't sound any better coming from you than it does from my precious aunt," Ghanima said. "The blood of a brother cannot be washed off. That's more than some little Fremen aphorism."

Irulan pressed her lips together, then: "Farad'n holds your grandmother captive. He holds Duncan and if we don't . . ."

"I'm not satisfied with your stories of how all this happened," Ghanima said, peering past Irulan at Alia. "Once, Duncan died rather than let enemies take my father. Perhaps this new ghola-flesh is no longer the same as . . ."

"Duncan was charged with protecting your grandmother's life!" Alia said, whirling in her chair. "I'm confident he chose the only way to do that." And she thought: *Duncan! Duncan! You weren't supposed to do it this way.*

Ghanima, reading the overtones of contrivance in Alia's voice, stared across at her aunt, then: "You're lying, O Womb of Heaven. I've heard about your fight with my grandmother. What is it you fear to tell us about her and your precious Duncan?"

"You've heard it all," Alia said, but she felt a stab of fear at this bald accusation and what it implied. Fatigue had made her careless, she realized. She arose, said: "Everything I know, you know." Turning to Irulan: "You work on her. She must be made to . . ."

Ghanima interrupted with a coarse Fremen expletive which came shockingly from the immature lips. Into the quick silence, she said: "You think me just a mere child, that you have years in which to work on me, that eventually I'll accept. Think again, O Heavenly Regent. You know better than anyone the years I have within me. I'll listen to them, not to you."

Alia barely suppressed an angry retort, stared hard at Ghanima. *Abomination?* Who was this child? A new fear of Ghanima began to rise in Alia. Had she accepted her

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own compromise with the lives which came to her pre-born? Alia said: "There's time yet for you to see reason."

"There may be time yet for me to see Farad'n's blood spurt around my knife," Ghanima said. "Depend on it. If I'm ever left alone with him, one of us will surely die."

"You think you loved your brother more than I?" Irulan demanded. "You play a fool's game! I was mother to him as I was to you. I was . . ."

"You never knew him," Ghanima said. "All of you, except at times my *beloved aunt,* persist in thinking us children. You're the fools! Alia knows! Look at her run away from . . ."

"I run from nothing," Alia said, but she turned her back on Irulan and Ghanima, stared at the two amazons who were pretending not to hear this argument. They'd obviously given up on Ghanima. Perhaps they sympathized with her. Angrily, Alia sent them from the room. Relief was obvious on their faces as they obeyed.

"You run," Ghanima persisted.

"I've chosen a way of life which suits me," Alia said, turning back to stare at Ghanima sitting cross-legged on the cot. Was it possible she'd made that terrible inner compromise? Alia tried to see the signs of it in Ghanima, but was unable to read a single betrayal. Alia wondered then: *Has she seen it in me? But how could she?*

"You feared to be the window for a multitude," Ghanima accused. "But we're the pre-born and we know. You'll be their window, conscious or unconscious. You cannot deny them." And she thought: *Yes, I know you--Abomination. And perhaps I'll go as you have gone, but for now I can only pity you and despise you.*

Silence hung between Ghanima and Alia, an almost palpable thing which alerted the Bene Gesserit training in Irulan. She glanced from one to the other, then: "Why're you so quiet suddenly?"

"I've just had a thought which requires considerable reflection," Alia said.

"Reflect at your leisure, dear Aunt," Ghanima sneered.

Alia, putting down fatigue-inflamed anger, said: "Enough for now! Leave her to think. Perhaps she'll come to her senses."

Irulan arose, said: "It's almost dawn anyway. Ghani, before we go, would you care to hear the latest message from Farad'n?"

"I would not," Ghanima said. "And hereafter, cease calling me by that ridiculous diminutive. Ghani! It merely supports the mistaken assumption that I'm a child you can . . ."

"Why'd you and Alia grow so suddenly quiet?" Irulan asked, reverting to her previous question, but casting it now in a delicate mode of Voice.

Ghanima threw her head back in

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laughter. "Irulan! You'd try Voice on me?"

"What?" Irulan was taken aback.

"You'd teach your grandmother to suck eggs," Ghanima said.

"I'd what?"

"The fact that I remember the expression and you've never even heard it before should give you pause," Ghanima said. "It was an old expression of scorn when you Bene Gesserit were young. But if that doesn't chasten you, ask yourself what your royal parents could've been thinking of when they named you Irulan? Or is it Ruinal?"

In spite of her training, Irulan flushed. "You're trying to goad me, Ghanima."

"And you tried to use Voice on me. On me! I remember the first human efforts in that direction. I remember *then,* Ruinous Irulan. Now, get out of here, all of you."

But Alia was intrigued now, caught by an inner suggestion which sloughed her fatigue aside. She said: "Perhaps I've a suggestion which could change your mind, Ghani."

"Still Ghani!" A brittle laugh escaped Ghanima, then: "Reflect but a moment: If I desire to kill Farad'n, I need but fall in with your plans. I presume you've thought of that. Beware of *Ghani* in a tractable mood. You see, I'm being utterly candid with you."

"That's what I hoped," Alia said. "If you . . ."

"The blood of a brother cannot be washed away," Ghanima said. "I'll not go before my Fremen loved ones a traitor to that. *'Never to forgive, never to forget.'* Isn't that our catechism? I warn you here, and I'll say it publicly: you cannot betroth me to Farad'n. Who, knowing me, would believe it? Farad'n himself could not believe it. Fremen, hearing of such a betrothal, would laugh into their sleeves and say: 'See! She lures him into a trap.' If you . . ."

"I understand that," Alia said, moving to Irulan's side. Irulan, she noted, was standing in shocked silence, aware already of where this conversation was headed.

"And so I would be luring him into a trap," Ghanima said. "If that's what you want, I'll agree, but he may not fall. If you wish this false betrothal as the empty coin with which to buy back my grandmother and your precious Duncan, so be it. But it's on your head. Buy them back. Farad'n, though, is mine. Him I'll kill."

Irulan whirled to face Alia before she could speak. "Alia! If we go back on our word . . ." She let it hang there a moment while Alia smilingly reflected on the potential wrath among the Great Houses in Faufreluches Assembled, the destructive consequences to belief in Atreides honor, the loss of religious trust, all of the great and small building blocks which would tumble.

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"It'd rule against us," Irulan protested. "All belief in Paul's prophethood would be destroyed. It . . . the Empire . . ."

"Who could dare question our right to decide what is wrong and what is right?" Alia asked, voice mild. "We mediate between good and evil. I need but proclaim . . ."

"You can't do this!" Irulan protested. "Paul's memory . . ."

"Is just another tool of Church and State," Ghanima said. "Don't speak foolishness, Irulan." Ghanima touched the crysknife at her waist, looked up at Alia. "I've misjudged my clever aunt, Regent of all that's Holy in Muad'Dib's Empire. I have, indeed, misjudged you. Lure Farad'n into our parlor if you will."

"This is recklessness," Irulan pleaded.

"You agree to this betrothal, Ghanima?" Alia asked, ignoring Irulan.

"On my terms," Ghanima said, hand still on her crysknife.

"I wash my hands of this," Irulan said, actually wringing her hands. "I was willing to argue for a true betrothal to heal . . ."

"We'll give you a wound much more difficult to heal, Alia and I," Ghanima said. "Bring him quickly, if he'll come. And perhaps he will. Would he suspect a mere child of my tender years? Let us plan the formal ceremony of betrothal to require his presence. Let there be an opportunity for me to be alone with him for a minute or two . . ."

Irulan shuddered at this evidence that Ghanima was, after all, Fremen entire, child no different from adult in this terrible bloodiness. After all, Fremen children were accustomed to slay the wounded on the battlefield, releasing women from this chore that they might collect the bodies and haul them away to the deathstills. And Ghanima, speaking with the voice of a Fremen child, piled horror upon horror by the studied maturity of her words, by the ancient sense of vendetta which hung like an aura around her.

"Done," Alia said, and she fought to keep voice and face from betraying her glee. "We'll prepare the formal charter of betrothal. We'll have the signatures witnessed by the proper assemblage from the Great Houses. Farad'n cannot possibly doubt . . ."

"He'll doubt, but he'll come," Ghanima said. "And he'll have guards. But will they think to guard him from me?"

"For the love of all that Paul tried to do," Irulan protested, "let us at least make Farad'n's death appear an accident, or the result of malice by outside . . ."

"I'll take joy in displaying my bloody knife to my brethren," Ghanima said.

"Alia, I beg you," Irulan said, "Abandon this rash insanity. Declare *kanly* against Farad'n, anything to . . ."

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"We don't require formal declaration of vendetta against him," Ghanima said. "The whole Empire knows how we must feel." She pointed to the sleeve of her robe. "We wear the yellow of mourning. When I exchange it for the black of a Fremen betrothed, will that fool anyone?"

"Pray that it fools Farad'n," Alia said, "and the delegates of the Great Houses we invite to witness the . . ."

"Every one of those delegates will turn against you," Irulan said. "You know that!"

"Excellent point," Ghanima said. "Choose those delegates with care, Alia. They must be ones we won't mind eliminating later."

Irulan threw up her arms in despair, turned and fled.

"Have her put under close surveillance lest she try to warn her nephew," Ghanima said.

"Don't try to teach me how to conduct a plot," Alia said. She turned and followed Irulan, but at a slower pace. The guards outside and the waiting aides were sucked up in her wake like sand particles drawn into the vortex of a rising worm.

Ghanima shook her head sadly from side to side as the door closed, thought: *It's as poor Leto and I thought. Gods below! I wish it'd been me the tiger killed instead of him.*

Many forces sought control of the Atreides twins, and when the death of Leto was announced, this movement of plot and counterplot was amplified. Note the relative motivations: The Sisterhood feared Alia, an adult Abomination, but still wanted those genetic characteristics carried by the Atreides. The Church hierarchy of Auqaf and Hajj saw only the power implicit in control of Muad'Dib's heir. Alia wanted Ghanima neutralized as a key to assuming Muad'Dib's role. CHOAM wanted a doorway to the wealth of Dune. Farad'n and his Sardaukar sought a return to glory for House Corrino. The Spacing Guild feared the equation Arrakis = melange; without the spice they could not navigate. Jessica wished to repair what her disobedience to the Bene Gesserit had created. Few thought to ask the twins what their plans might be, until it was too late.

—The Book of Kreos

Shortly after the evening meal, Leto saw a man walking past the arched doorway to his chamber and his mind went with the man. The passage had been left open and Leto had seen some activity out there—spice hampers being wheeled past, three women with the obvious off-world sophistication of dress which marked them as smugglers. This man who took Leto's mind walking might have been no different except that he walked like Stilgar, a much younger Stilgar.

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It was a peculiar walk his mind took. Time filled Leto's awareness like a stellar globe. He could see infinite timespaces, but he had to press into his own future before knowing in which moment his flesh lay. His multifaceted memory-lives surged and receded, but they were his now. They were like waves on a beach, but if they rose too high, he could command them and they would retreat, leaving the Royal Harum behind.

Now and again, he would listen to those memory lives. One would rise like a prompter, poking its head up out of the stage and calling cues for his behavior. His father came during the mind-walk and said: "You are a child seeking to be a man. When you are a man, you will seek in vain for the child you were."

All the while, he felt his body being plagued by the fleas and lice of an old sietch poorly maintained. None of the attendants who brought his heavily spice-laced food appeared bothered by the creatures. Did these people have immunity from such things, or was it only that they had lived with them so long they could ignore discomfort?

Who were these people assembled around Gurney? How had they come to this place? Was this Jacurutu? His multi-memories produced answers he did not like. They were ugly people and Gurney was the ugliest. Perfection floated here, though, dormant and waiting beneath an ugly surface.

Part of him knew he remained spice-bound, held in bondage by the heavy dosages of melange in every meal. His child's body wanted to rebel while his persona raved with the immediate presence of memories carried over from thousands of eons.

His mind returned from its walk, and he wondered if his body had really stayed behind. Spice confused the senses. He felt the pressures of self-limitations piling up against him like the long barachan dunes of the bled slowly building themselves a ramp against a desert cliff. One day, a few trickles of sand would flow over the cliff, then more and more and more . . . and only the sand would remain exposed to the sky.

But the cliff would still be there underneath.

I'm still within the trance, he thought.

He knew he would come soon to a branching of life and death. His captors kept sending him back into the spice thralldom, unsatisfied with his responses at every return. Always, treacherous Namri waited there with his knife. Leto knew countless pasts and futures, but he had yet to learn what would satisfy Namri . . . or Gurney Halleck. They wanted something outside of the visions. The life and death branching lured Leto. His life, he knew, would have to possess some

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inner meaning which carried it above the vision circumstances. Thinking of this demand, he felt that his inner awareness was his true being, and his outer existence was the trance. This terrified him. He did not want to go back to the sietch with its fleas, its Namri, its Gurney Halleck.

I'm a coward, he thought.

But a coward, even a coward, might die bravely with nothing but a gesture. Where was that gesture which could make him whole once more? How could he awaken from trance and vision into the universe which Gurney demanded? Without that turning, without an awakening from aimless visions, he knew he could die in a prison of his own choosing. In this, he had at last come to cooperate with his captors. Somewhere, he had to find wisdom, an inner balance which would reflect upon the universe and return to him an image of calm strength. Only then might he seek his Golden Path and survive the skin which was not his own.

Someone was playing the baliset out there in the sietch. Leto felt that his body probably heard the music in the present. He sensed the cot beneath his back. He could hear music. It was Gurney at the baliset. No other fingers could quite compare with his mastery of that most difficult instrument. He played an old Fremen song, one called a *hadith* because of its internal narrative and the voice which invoked those patterns required for survival on Arrakis. The song told the story of human occupations within a sietch.

Leto felt the music move him through a marvelous ancient cavern. He saw women trampling spice residue for fuel, curding the spice for fermentation, forming spice fabrics. Melange was everywhere in the sietch.

Those moments came when Leto could not distinguish between the music and the people of the cavern vision. The whine and slap of a power loom was the whine and slap of the baliset. But his inner eyes beheld fabrics of human hair, the long fur of mutated rats, threads of desert cotton and strips curled from the skins of birds. He saw a sietch school. The eco-language of Dune raged through his mind on its wings of music. He saw the sun-powered kitchen, the long chamber where stillsuits were made and maintained. He saw weather forecasters reading the sticks they'd brought in from the sand.

Somewhere during this journey, someone brought him food and spooned it into his mouth, holding his head up with a strong arm. He knew this as a real-time sensation, but the marvelous play of motion continued within him.

As though it came in the next instant after the spice-laden food, he saw the hurtling of a sandstorm. Moving images within the sand

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breath became the golden reflections of a moth's eyes, and his own life was reduced to the viscous trail of a crawling insect.

Words from the Panoplia Propheticus raved through him: "It is said that there is nothing firm, nothing balanced, nothing durable in all the universe—that nothing remains in its state, that each day, some time each hour, brings change."

The old Missionaria Protectivus knew what they were doing, he thought. *They knew about Terrible Purposes. They knew how to manipulate people and religions. Even my father didn't escape them, not in the end.*

There lay the clue he'd been seeking. Leto studied it. He felt strength flowing back into his flesh. His entire multifaceted being turned over and looked out upon the universe. He sat up and found himself alone in the gloomy cell with only the light from the outer passage where the man had walked past and taken his mind an eon ago.

"Good fortune to us all!" he called in the traditional Fremen way.

Gurney Halleck appeared in the arched doorway, his head a black silhouette against the light from the outer passage.

"Bring light," Leto said.

"You wish to be tested further?"

Leto laughed. "No. It's my turn to test you."

"We shall see." Halleck turned away, returning in a moment with a bright blue glowglobe in the crook of his left elbow. He released it in the cell, allowing it to drift above their heads.

"Where's Namri?" Leto asked.

"Just outside where I can call him."

"Ahh, Old Father Eternity always waits patiently," Leto said. He felt curiously released, poised on the edge of discovery.

"You call Namri by the name reserved for Shai Hulud?" Halleck asked.

"His knife's a worm's tooth," Leto said. "Thus, he's Old Father Eternity."

Halleck smiled grimly, but remained silent.

"You still wait to pass judgment on me," Leto said. "And there's no way to exchange information, I'll admit, without making judgments. You can't ask the universe to be exact, though."

A rustling sound behind Halleck alerted Leto to Namri's approach. He stopped half a pace to Halleck's left.

"Ahhh, the left hand of the damned," Leto said.

"It's not wise to joke about the Infinite and the Absolute," Namri growled. He glanced sideways at Halleck.

"Are you God, Namri, that you invoke absolutes?" Leto asked. But he kept his attention on Halleck.

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Judgment would come from there.

Both men merely stared at him without answering.

"Every judgment teeters on the brink of error," Leto explained. "To claim absolute knowledge is to become monstrous. Knowledge is an unending adventure at the edge of uncertainty."

"What word game is this you play?" Halleck demanded.

"Let him speak," Namri said.

"It's the game Namri initiated with me," Leto said, and saw the old Fremen's head nod agreement. He'd certainly recognized the riddle game. "Our senses always have at least two levels," Leto said.

"Trivia and message," Namri said.

"Excellent!" Leto said. "You gave me trivia; I give you message. I see, I hear, I detect odors, I touch: I feel changes in temperature, taste. I sense the passage of time. I may take emotive samples. Ahhhhh! I am happy. You see, Gurney? Namri? There's no mystery about a human life. It's not a problem to be solved, but a reality to be experienced."

"You try our patience, lad," Namri said. "Is this the place where you wish to die?"

But Halleck put out a restraining hand.

"First, I am not a lad," Leto said. He made the fist sign at his right ear. "You'll not slay me; I've placed a water burden upon you."

Namri drew his crysknife half out of its sheath. "I owe you nothing!"

"But God created Arrakis to train the faithful," Leto said. "I've not only showed you my faith, I've made you conscious of your own existence. Life requires dispute. You've been made to *know*—by me!—that your reality differs from all others: thus, you know you're alive."

"Irreverence is a dangerous game to play with me," Namri said. He held his crysknife half drawn.

"Irreverence is a most necessary ingredient of religion," Leto said. "Not to speak of its importance in philosophy. Irreverence is the only way left to us for testing our universe."

"So you think you understand the universe?" Halleck asked, and he opened a space between himself and Namri.

"Ye-esss," Namri said, and there was death in his voice.

"The universe can be understood only by the wind," Leto said. "There's no mighty seat of reason which dwells within the brain. Creation is discovery. God discovered us in the Void because we moved against a background which He already knew. The wall was blank. Then there was movement."

"You play hide and seek with death," Halleck warned.

"But you are both my friends," Leto said. He faced Namri. "When you offer a candidate as Friend of your Sietch, do you not slay a

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hawk and an eagle as the offering? And is this not the response: 'God send each man at his end, such hawks, such eagles and such friends.'?"

Namri's hand slid from his knife. The blade slipped back into its sheath. He stared wide-eyed at Leto. Each sietch kept its friendship ritual secret, yet here was a selected part of the rite.

Halleck, though, asked: "Is this place your end?"

"I know what you need to hear from me, Gurney," Leto said, watching the play of hope and suspicion across the ugly face. Leto touched his own breast. "This child was never a child. My father lives within me, but he is not me. You loved him, and he was a gallant human whose affairs beat upon high shores. His intent was to close down the cycle of wars, but he reckoned without the movement of infinity as expressed by life. That's Rhajia! Namri knows. Its movement can be seen by any mortal. Beware paths which narrow future possibilities. Such paths divert you from infinity into lethal traps."

"What is it I need to hear from you?" Halleck asked.

"He's just word-playing," Namri said, but his voice carried deep hesitation, doubts.

"I ally myself with Namri against my father," Leto said. "And my father within allies himself with us against what was made of him."

"Why?" Halleck demanded.

"Because it's the *amor fati* which I bring to humankind, the act of ultimate self-examination. In this universe, I choose to ally myself against any force which brings humiliation upon humankind. Gurney! Gurney! You were not born and raised in the desert. Your flesh doesn't know the truth of which I speak. But Namri knows. In the open land, one direction is as good as another."

"I still have not heard what I must hear," Halleck snarled.

"He speaks for war and against peace," Namri said.

"No," Leto said. "Nor did my father speak against war. But look what was made of him. Peace has only one meaning in this Imperium. It's the maintenance of a single way of life. You are commanded to be contented. Life must be uniform on all planets as it is in the Imperial Government. The major object of priestly study is to find the correct forms of human behavior. For this they go to the words of Muad'Dib! Tell me, Namri, are you content?"

"No." The word came out flat, spontaneous rejection.

"Then do you blaspheme?"

"Of course not!"

"But you aren't contented. You see, Gurney? Namri proves it to us. Every question, every problem doesn't have a single correct answer. One must permit diversity. A monolith is unstable. Then why do you demand a single correct state-

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ment from me? Is that to be the measure of your monstrous judgment?"

"Will you force me to have you slain?" Halleck asked, and there was agony in his voice.

"No, I'll have pity upon you," Leto said. "Send word to my grandmother that I'll cooperate. The Sisterhood may come to regret my cooperation, but an Atreides gives his word."

"A Truthsayer should test that," Namri said. "These Atreides . . ."

"He'll have his chance to say before his grandmother what must be said," Halleck said. He nodded with his head toward the passage.

Namri paused before leaving, glanced at Leto. "I pray we do the right thing in leaving him alive."

"Go, friends," Leto said. "Go and reflect."

As the two men departed, Leto threw himself onto his back, feeling the cold cot against his spine. Movement sent his head spinning over the edge of his spice-burdened consciousness. In that instant, he saw the entire planet—every village, every town, every city, the desert places and the planted places. All of the shapes which smashed against his vision bore intimate relationships to a mixture of elements within themselves and without. He saw the structures of Imperial society reflected in the physical structures of its planets and their communities. Like a gigantic unfolding within him, he saw this revelation for what it must be: a window into the society's invisible parts. Seeing this, Leto realized that every system had such a window. Even the system of himself and his universe. He began peering into windows, a cosmic voyeur.

This was what his grandmother and the Sisterhood sought! He knew it. His awareness flowed on a new, higher level. He felt the past carried in his cells, in his memories, in the archetypes which haunted his assumptions, in the myths which hemmed him, in his languages and their prehistoric detritus. It was all of the shapes out of his human and nonhuman past, all of the lives which he now commanded, all integrated in him at last. And he felt himself as a thing caught up in the ebb and flow of nucleotides. Against the backdrop of infinity, he was a protozoan creature in which birth and death were virtually simultaneous, but he was both infinite and protozoan, a creature of molecular memories.

We humans are a form of colony organism! he thought.

They wanted his cooperation. Promising cooperation had won him another reprieve from Namri's knife. By summoning to cooperation, they sought to recognize a healer.

And he thought: *But I'll not bring them social order in the way they expect it.*

A grimace contorted Leto's mouth. He knew he'd not be as un-

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consciously malevolent as was his father: despotism at one terminal and slavery at the other, but this universe might pray for those 'good old days.'

His father-within spoke to him then, cautiously probing, unable to demand attention, but pleading for audience.

And Leto answered: "No. We will give them complexities to occupy their minds. There are many modes of flight from danger. How will they know I'm dangerous unless they experience me for thousands of years? Yes, Father-within, we'll give them question marks."

There is no guilt or innocence in you. All of that is past. Guilt belabors the dead and I am not the Iron Hammer. You multitude of the dead are merely people who have done certain things and the memory of those things illuminates my path.

—Leto II to His Memory Lives After Harq al-Ada

"It moves of itself!" Farad'n said and his voice was barely a whisper.

He stood above the Lady Jessica's bed, a brace of guards close behind him. The Lady Jessica had propped herself up in the bed. She was clad in a parasilk gown of shimmering white with a matching band around her copper hair. Farad'n had come bursting in upon her moments before. He wore the gray leotard and his face was sweaty with excitement and the exertions of his dash through the palace corridors.

"What time is it?" Jessica asked.

"Time?" Farad'n appeared puzzled.

One of the guards spoke up: "It is the third hour past midnight, My Lady." The guard glanced fearfully at Farad'n. The young prince had come dashing through the night-lighted corridors, picking up startled guards in his wake.

"But it moves," Farad'n said. He held out his left hand, then his right. "I saw my own hands shrink into chubby fists, and I remembered! They were my hands when I was an infant. I remembered being an infant, but it was . . . a clearer memory. I was reorganizing my old memories!"

"Very good," Jessica said. His excitement was infectious. "And what happened when your hands became old?"

"My . . . mind was . . . sluggish," he said. "I felt an ache in my back. Right here." He touched a place over his left kidney.

"You've learned a most important lesson," Jessica said. "Do you know what that lesson is?"

He dropped his hands to his sides, stared at her, then: "My mind controls my reality." His eyes glittered, and he repeated it louder: "My mind controls my reality!"

"That is the beginning of prana-bindu balance," Jessica said. "It is only the beginning, though."

"What do I do next?" he asked.

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"My Lady," the guard who had answered her question ventured now to interrupt. "The hour," he said.

Aren't their spy posts manned at this hour? Jessica wondered. She said: "Be gone. We have work to do."

"But, My Lady," the guard said, and he looked fearfully from Farad'n to Jessica and back.

"You think I'm going to seduce him?" Jessica asked.

The man stiffened.

Farad'n laughed, a joyous outburst. He waved a hand in dismissal. "You heard her. Be gone."

The guards looked at each other, but they obeyed.

Farad'n sat on the edge of her bed. "What next?" He shook his head. "I wanted to believe you, yet I did not believe. Then . . . it was as though my mind melted. I was tired. My mind gave up its fighting against you. It happened. Just like that!" He snapped his fingers.

"It was not me that your mind fought against," Jessica said.

"Of course not," he admitted. "I was fighting against myself, all the nonsense I've learned. What next now?"

Jessica smiled. "I confess I didn't expect you to succeed this rapidly. It's been only eight days and . . ."

"I was patient," he said, grinning.

"And you've begun to learn patience, too," she said.

"Begun?"

"You've just crept over the lip of this learning," she said. "Now, you're truly an infant. Before . . . you were only a potential, not even born."

The corners of his mouth drew down.

"Don't be so gloomy," she said. "You've done it. That's important. How many can say they were born anew?"

"What comes next?" he asked, insistently.

"You will practice this thing you've learned," she said. "I want you able to do this at will, easily. Later, you'll fill a new place in your awareness which this has opened. It will be filled by the ability to test any reality against your own demands."

"Is that all I do now . . . practice the . . ."

"No. Now, you can begin the muscle training. Tell me, can you move the little toe on your left foot without moving any other muscle of your body?"

"My . . ." She saw a distant expression come over his face as he tried to move the toe. He looked down at his foot presently, staring at it. Sweat broke out on his forehead. A deep breath escaped him. "I can't do it."

"Yes you can," she said. "You will learn to do it. You will learn every muscle in your body. You will know these muscles the way you know your hands."

He swallowed hard at the magni-

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tude of this prospect, then: "What are you doing to me? What is your plan for me?"

"I intend to turn you loose upon the universe," she said. "You will become whatever it is you most deeply desire."

He mulled this for a moment. "Whatever I desire?"

"Yes."

"That's impossible."

"Unless you learn to control your desires the way you control your reality," she said. And she thought: *There! Let his analysts examine that. They'll advise cautious approval, but Farad'n will move a step closer to realization of what I'm really doing.*

He proved her surmise by saying: "It's one thing to tell a person he'll realize his heart's desire. It's another thing to actually deliver that realization."

"You've come farther than I thought," Jessica said. "Very good. I promise you: If you complete this program of learning, you'll be your own man. Whatever you do, it'll be because that's what you want to do."

And let a Truthsayer try to pry that apart, she thought.

He stood up, but the expression he bent upon her was warm, a sense of camaraderie in it. "You know, I believe you. Damned if I know why, but I do. And I won't say a word about the other things I'm thinking."

Jessica watched his retreating back as he let himself out of her bedchamber. She turned off the glowglobes, lay back. This Farad'n was a deep one. He'd as much as told her that he was beginning to see her design, but he was joining her conspiracy of his own volition.

Wait until he begins to learn his own emotions, she thought. With that, she composed herself for the return to sleep. The morrow, she knew, would be plagued by casual encounters with palace personnel asking seemingly innocuous questions.

Humankind periodically goes through a speedup of its affairs, thereby experiencing the race between the renewable vitality of the living and the beckoning vitiation of decadence. In this periodic race, any pause becomes luxury. Only then, can one reflect that all is permitted; all is possible.

—The Apocrypha of Muad'Dib

The touch of sand is important, Leto told himself.

He could feel the grit beneath him where he sat beneath a brilliant sky. They had force-fed him another heavy dosage of melange and Leto's mind turned upon itself like a whirlpool. An unanswered question lay deep within the funnel of the whirlpool: *Why do they insist that I say it?* Gurney was stubborn; no doubt of that. And he'd had his orders from his Lady Jessica.

They'd brought him out of the

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sietch into the daylight for this *lesson.* He had the strange sensation that he'd let his body take the short trip from the sietch while his inner being mediated a battle between the Duke Leto I and the old Baron Harkonnen. They'd fought within him, through him, because he would not let them communicate directly. The fight had taught him what had happened to Alia. Poor Alia.

I was right to fear the spice trip, he thought.

A welling bitterness toward the Lady Jessica filled him. Her damned *gom jabbar!* Fight it and win or die in the attempt. She couldn't put a poisoned needle against his neck, but she could send him into the valley of peril which had claimed her own daughter.

Snuffling sounds intruded upon his awareness. They wavered, growing louder, then softer, louder . . . softer. There was no way for him to determine whether they had current reality or came from the spice.

Leto's body sagged over his folded arms. He felt hot sand through his buttocks. There was a rug directly in front of him, but he sat on open sand. A shadow lay across the rug: Namri. Leto stared into the muddy pattern of the rug, feeling bubbles ripple there. His awareness drifted on its own current through a landscape which stretched out to a horizon of shock-headed greenery.

His skull thrummed with drums. He felt heat, fever. The fever was a pressure of burning which filled his senses, crowding out awareness of flesh until he could only feel the moving shadows of his peril. Namri and the knife. Pressure . . . pressure . . . Leto lay at last suspended between sky and sand, his mind lost to all but the fever. Now, he waited for something to happen, sensing that any occurrence would be a first-and-only thing.

Hot-hot pounding sunshine crashed brilliantly around him, without tranquility, without remedy. *Where is my Golden Path?* Everywhere bugs crawled. Everywhere. *My skin is not my own.* He sent messages along his nerves, waited out the dragging other-person responses.

Up head, he told his nerves.

A head which might have been his own crept upward, looked out at patches of blankness in the bright light.

Someone whispered: "He's deep into it now."

No answer.

Burn fire sun building heat on heat.

Slowly, outbending, the current of his awareness took him drifting through a last screen of green blankness and there, across low folding dunes, distant no more than a kilometer beyond the stretched-out chalk line of a cliff, *there* lay the green burgeoning future, upflung, flowing into endless green,

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greenswelling, green-green moving outward endlessly.

In all of that green there was not one great worm.

Riches of wild growth, but nowhere Shai Hulud.

Leto sensed that he had ventured across old boundaries into a new land which only the imagination had witnessed and that he looked now directly through the very next veil which a yawning humankind called *unknown.*

It was bloodthirsty reality.

He felt the red fruit of his life swaying on a limb, fluid slipping away from him and the fluid was the spice essence flowing through his veins.

Without Shai Hulud, no more spice.

He had seen a future without the great gray worm-serpent of Dune. He knew this, yet could not tear himself from the trance to rail against such a passage.

Abruptly, his awareness plunged back—back, back, away from such a deadly future. His thoughts went into his bowels, becoming primitive, moved only by intense emotions. He found himself unable to focus on any particular aspect of his vision or his surroundings, but there was a voice within him. It spoke an ancient language and he understood it perfectly. The voice was musical and lilting, but its words bludgeoned him.

"It is not the present which influences the future, thou fool, but the future which forms the present. You have it all backward. Since the future is set, an unfolding of events which will assure that future is fixed and inevitable."

The words transfixed him. He felt terror rooted in the heavy matter of his body. By this, he knew his body still existed, but the reckless nature and enormous power of his vision left him feeling contaminated, defenseless, unable to signal a muscle and gain its obedience. He knew he was submitting more and more to the onslaught of those collective lives whose memories once had made him believe he was real. Fear filled him. He thought that he might be losing the inner command, falling at last into Abomination.

Leto felt his body twisting in terror.

He had come to depend upon his victory and the newly won benevolent cooperation of those memories. They had turned against him, all of them—even Royal Harum whom he'd trusted. He lay shimmering on a surface which had no roots, unable to give any expression to his own life. He tried to concentrate upon a mental picture of himself, was confronted by overlapping frames, each a different age: infant into doddering ancient. He recalled his father's early training: *Let the hands grow young, then old.* But his whole body was immersed now in this lost reality and the entire image progression melted into other

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faces, the features of those who had given him their memories.

A diamond thunderbolt shattered him.

Leto felt pieces of his awareness drifting apart, yet he retained a sense of himself somewhere between being and nonbeing. Hope quickening, he felt his body breathing–in . . . out. He took in a deep breath: *yin.* He let it out: *yang.*

Somewhere just beyond his grasp lay a place of supreme independence, a victory over all of the confusions inherent in his multitude of lives–no false sense of command, but a true victory. He knew his previous mistake now: he had sought power in the reality of his trance, choosing that rather than face the fears which he and Ghanima had fed in each other.

Fear defeated Alia!

But the seeking after power spread another trap, diverting him into fantasy. He saw the illusion. The entire illusion process rotated half a turn and now he knew a center from which he could watch without purpose the flight of his visions, of his inner lives.

Elation flooded him. It made him want to laugh, but he denied himself this luxury, knowing it would bar the doors of memory.

Ahhhh, my memories, he thought. *I have seen your illusion. You no longer invent the next moment for me. You merely show me how to create new moments. I'll not lock myself on the old tracks.*

This thought passed through his awareness as though wiping a surface clean and in its wake he felt his entire body, an *einfalle* which reported in most minute detail on every cell, every nerve. He entered a state of intense quiet. In this quiet, he heard voices, knowing they came from a great distance, but he heard them clearly as though they echoed in a chasm.

One of the voices was Halleck's. "Perhaps we gave him too much of it."

Namri answered. "We gave him exactly what she told us to give him."

"Perhaps we should go back out there and have another look at him." Halleck.

"Sabiha is good at such things; she'll call us if anything starts to go wrong." Namri.

"I don't like this business of Sabiha." Halleck.

"She's a necessary ingredient." Namri.

Leto felt bright light outside himself and darkness within, but the darkness was secretive, protective and warm. The light began to blaze up and he felt that it came from the darkness within, swirling outward like a brilliant cloud. His body became transparent, drawing him upward, yet he retained that *einfalle* contact with every cell and nerve. The multitude of inner lives fell into alignment, nothing tangled or mixed. They became very quiet in duplication of his own inner si-

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lence, each memory-life discrete, an entity incorporeal and undivided.

Leto spoke to them then: "I am your spirit. I am the only life you can realize. I am the house of your spirit in the land which is nowhere, the land which is your only remaining home. Without me, the intelligible universe reverts to chaos. Creative and abysmal are inextricably linked in me; only I can mediate between them. Without me, mankind will sink into the mire and vanity of *knowing*. Through me, you and they will find the only way out of chaos: *understanding by living*."

With this, he let go of himself and became himself, his own person compassing the entirety of his past. It was not victory, nor defeat, but a new thing to be shared with any inner life he chose. Leto savored this newness, letting it possess every cell, every nerve, giving up what the *einfalle* had presented to him and recovering the totality in the same instant.

After a time, he awoke in white darkness. With a flash of awareness, he knew where his flesh was: seated on sand about a kilometer from the cliff wall which marked the northern boundary of the sietch. He knew that sietch now: Jacurutu for certain . . . and Fondak. But it was far different from the myths and legends and

the rumors which the smugglers allowed.

A young woman sat on a rug directly in front of him, a bright glowglobe anchored to her left sleeve and drifting just above her head. When Leto looked away from the glowglobe, there were stars. He knew this young woman; she was the one from his vision earlier, the roaster of coffee. She

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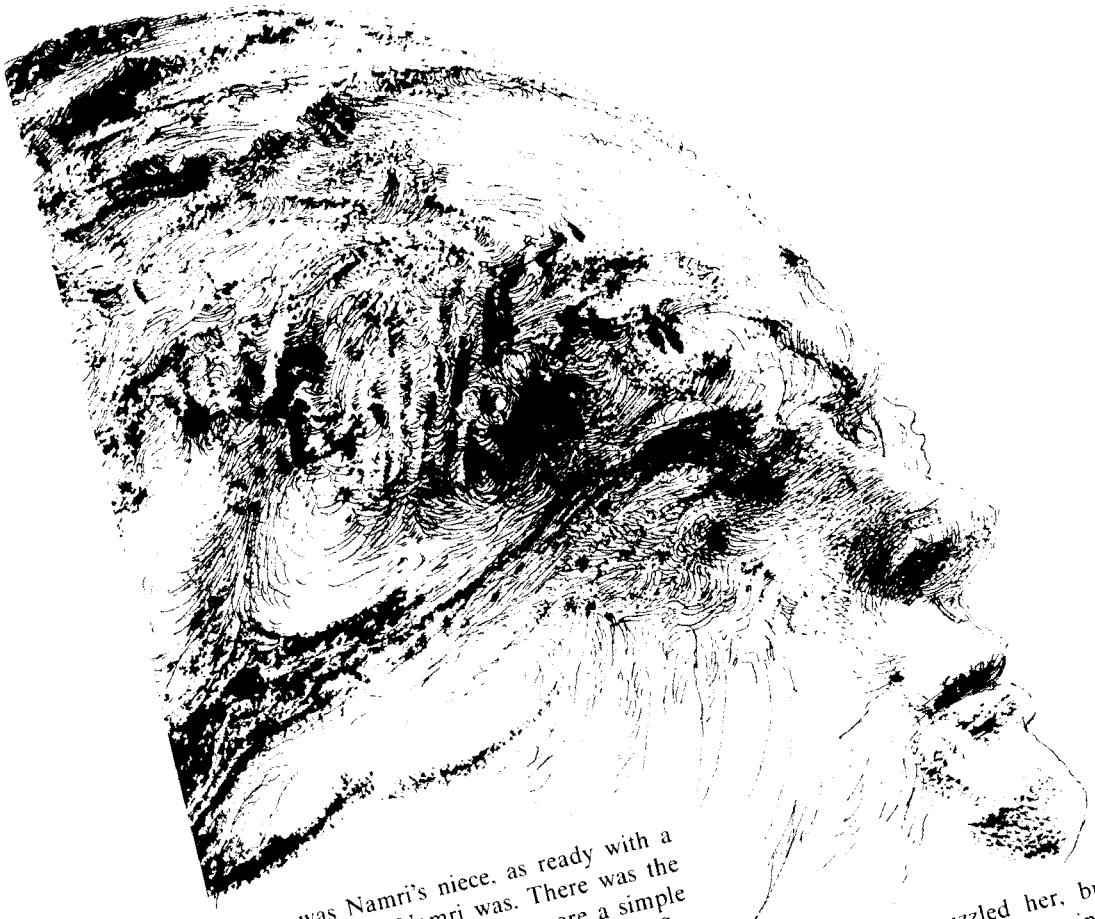

was Namri's niece, as ready with a knife as Namri was. There was the knife in her lap. She wore a simple green robe over a gray stillsuit. *Sabiha*, that was her name. And Namri had his own plans for her.

Sabiha saw the awakening in his eyes, said: "It's almost dawn. You've spent the whole night here."

"And most of a day," he said. "You make good coffee."

This statement puzzled her, but she ignored it with a single-mindedness which spoke of harsh training and explicit instructions for her present behavior.

"It's the hour of assassins," Leo said. "But your knife is no longer

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needed." He glanced at the crysknife in her lap.

"Namri will be the judge of that," she said.

Not Halleck, then. She only confirmed his inner knowledge.

"Shai Hulud is a great garbage collector and eraser of unwanted evidence," Leto said. "I've used him thus myself."

She rested her hand lightly on the knife handle.

"How much is revealed by where we sit and how we sit," he said. "You sit upon the rug and I upon the sand."

Her hand closed over the knife handle.

Leto yawned, a gaping and stretching which made his jaws ache. "I've had a vision which included you," he said.

Her shoulders relaxed slightly.

"We've been very one-sided about Arrakis," he said. "Barbaric of us. There's a certain momentum in what we've been doing, but now we must undo some of our work. The scales must be brought into better balance."

A puzzled frown touched Sabiha's face.

"My vision," he said. "Unless we restore the dance of life here on Dune, the dragon on the floor of the desert will be no more."

Because he'd used the old Fremen name for the great worm, she was a moment understanding him, then: "The worms?"

"We're in a dark passage," he said. "Without spice, the Empire falls apart. The Guild will not move. Planets will slowly lose their clear memories of each other. They'll turn inward upon themselves. Space will become a boundary when the Guild navigators lose their mastery. We'll cling to our dunetops and be ignorant of that which is above us and below us."

"You speak very strangely," she said. "How have you seen *me* in your vision?"

Trust Fremen superstition! he thought. He said: "I've become pasigraphic. I'm a living glyph to write out the changes which must come to pass. If I do not write them, you'll encounter such heartache as no human should experience."

"What words are these?" she asked, but her hand remained lightly on the knife.

Leto turned his head toward the cliffs of Jacurutu, seeing the beginning glow which would be second moon making its predawn passage behind the rocks. The death scream of a desert hare shocked its way through him. He saw Sabiha shudder. There came the beating of wings—a predator bird, night creature here. He saw the ember glow of many eyes as they swept past above him, headed for crannies in the cliff.

"I must follow the dictates of my new heart," Leto said. "You look upon me as a mere child, Sabiha, but if . . ."

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"They warned me about you," Sabiha said and now her shoulders were stiff with readiness.

He heard the fear in her voice, said: "Don't fear me, Sabiha. You've lived eight more years than this flesh of mine. For that, I honor you. But I have untold thousands more years of other lives, far more than you have known. Don't look upon me as a child. I have bridged the many futures and, in one, saw us entwined in love. You and I, Sabiha."

"What are . . . this can't . . ." She broke off in confusion.

"The idea could grow on you," he said. "Now, help me back to the sietch for I've been in far places and am weak with the weariness of my travels. Namri must hear where I have been."

He saw the indecision in her, said: "Am I not the Guest of the Cavern? Namri must learn what I have learned. We have many things to do lest our universe degenerate."

"I don't believe that . . . about the worms," she said.

"Nor about us entwined in love?"

She shook her head. But he could see the thoughts drifting through her mind like wind-blown feathers. His words both attracted and repelled her. To be consort of power, that certainly carried high allure. Yet, there were her uncle's orders. But, one day, this son of Muad'Dib might rule here on Dune and in the farthest reaches of their universe. She encountered then an extremely Fremen, cavern-hiding aversion to such a future. The consort of Leto would be seen by everyone, would be an object of gossip and speculations. She could have wealth, though, and . . .

"I am the son of Muad'Dib, able to see the future," he said.

Slowly, she replaced her knife in its sheath, lifted herself easily from the rug, crossed to his side and helped him to his feet. Leto found himself amused by her actions then: she folded the rug neatly and draped it across her right shoulder. He saw her measuring the difference in their sizes, reflecting upon his words: *Entwined in love?*

Size is another thing that changes, he thought.

She put a hand on his arm then to help him and control him. He stumbled and she spoke sharply: "We're too far from the sietch for *that!*" Meaning the unwanted sound which might attract a worm.

Leto felt that his body had become a dry shell like that abandoned by an insect. He knew this shell: it was one with the society which had been built upon the melange trade and its Religion of the Golden Elixir. It was emptied by its excesses. Muad'Dib's high aims had fallen into wizardry which was enforced by the military arm of Auqaf. Muad'Dib's religion had another name now; it was Shien-san-Shao, an Ixian label which designated the intensity and insanity of

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those who thought they could bring the universe to paradise at the point of a crysknife. But that too would change as Ix had changed. For they were merely the ninth planet of their sun and had even forgotten the language which had given them their name.

"The Jihad was a kind of mass insanity," he muttered.

"What?" Sabiha had been concentrating on the problem of making him walk without rhythm, hiding their presence out here on open sand. She was a moment focusing on his words, then interpreted them as another product of his obvious fatigue. She felt the weakness of him, the way he'd been drained by the trance. It seemed pointless and cruel to her. If he were to be killed as Namri said, then it should be done quickly without all of this byplay. Leto had spoken of a marvelous revelation, though. Perhaps that was what Namri sought. Certainly that must be the motive behind the behavior of this child's own grandmother. Why else would Our Lady of Dune give her sanction to these perilous acts against a child?

Child?

Again, she reflected upon his words. They were at the cliff base now and she stopped her charge, letting him relax a moment here where it was safer. Looking down at him in the dim starlight, she asked: "How could there be no more worms?"

"Only I can change that," he said. "Have no fear. I can change anything."

"But it's . . ."

"Some questions have no answers," he said. "I've seen that future, but the contradictions would only confuse you. This is a changing universe and we are the strangest change of all. We resonate to many influences. Our futures need constant updating. Now, there's a barrier which we must remove. This requires that we do brutal things, that we go against our most basic, our dearest wishes . . . but it must be done."

"What must be done?"

"Have you ever killed a friend?" he asked and, turning, led the way into the gap which sloped upward to the sietch's hidden entrance. He moved as quickly as his trance-fatigue would permit, but she was right behind him, clutching his robe and pulling him to a stop. "What's this of killing a friend?"

"He'll die anyway," Leto said. "I don't have to do it, but I could prevent it. If I don't prevent it, is that not killing him?"

"Who is this . . . who will die?"

"The alternative keeps me silent," he said. "I might have to give my sister to a monster."

Again, he turned away from her and this time, when she pulled at his robe, he resisted, refusing to answer her questions. *Best she not know until the time comes,* he thought.

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Natural selection has been described as an environment selectively screening for those who will have progeny. Where humans are concerned, though, this is an extremely limiting viewpoint. Reproduction by sex tends toward experiment and innovation. It raises many questions, including the ancient one about whether environment is a selective agent after the variation occurs, or whether environment plays a pre-selective role in determining the variations which it screens. Dune did not really answer those questions; it merely raised new questions which Leto and the Sisterhood may attempt to answer over the next five hundred generations.

–The Dune Catastrophe
After Harq al-Ada

The bare brown rocks of the Shield Wall loomed in the distance, visible to Ghanima as the embodiment of that apparition which threatened her future. She stood at the edge of the roof garden atop the Keep, the setting sun at her back. The sun held a deep orange glow from intervening dust clouds, a color as rich as the rim of a worm's mouth. She sighed, thinking: *Alia . . . Alia–is your fate to be my fate?*

The inner lives had grown increasingly clamorous of late. There was something about female conditioning in a Fremen society, perhaps it was a real sexual difference, but whatever, the female was more susceptible to that inner tide. Her grandmother had warned about it as they'd schemed, drawing on the accumulated wisdom of the Bene Gesserit, but awakening that wisdom's threats within Ghanima.

"Abomination," the Lady Jessica had said, "our term for the preborn, has a long history of bitter experiences behind it. The way of it seems to be that the inner lives divide. They split into the benign and the malignant. The benign remain tractable, useful. The malignant appear to unite in one powerful psyche, trying to take over the living flesh and its consciousness. The process is known to take considerable time, but its signs are well known."

"Why did you abandon Alia?" Ghanima asked.

"I fled in terror of what I'd created," Jessica said, her voice low. "I gave up. And my burden now is that . . . perhaps I gave up too soon."

"What do you mean?"

"I cannot explain yet, but . . . maybe . . . no! I'll not give you false hopes. Ghafla, the abominable distraction, has a long history in human mythology. It was called many things, but chiefly it was called *Possession.* That's what it seems to be. You lose your way in the malignancy and it takes possession of you."

"Leto . . . feared the spice," Ghanima said, finding that she

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could talk about him quietly. The terrible price demanded of them!

"And wisely," Jessica had said. She would say no more.

But Ghanima had risked an exploration of her inner memories, peering past an odd blurred veil and expanding on the Bene Gesserit fears to no avail. To explain what had befallen Alia did not ease it one bit. The Bene Gesserit accumulation of experience had pointed to a possible way out of the trap, though, and when Ghanima ventured the inner sharing, she first called upon the *Mohalata*, a partnership of the benign which might protect her.

She recalled that sharing as she stood in the sunset glow at the edge of the Keep's roof garden. Immediately, she felt the memory-presence of her mother. Chani stood there, an apparition between Ghanima and the distant cliffs.

"Enter here and you will eat the fruit of the Zaqquum, the food of hell!" Chani said. "Bar this door, my daughter; it is your only safety."

The inner clamor lifted itself around the vision and Ghanima fled, sinking her consciousness into the Sisterhood's Credo, reacting out of desperation more than trust. Quickly, she recited the Credo, moving her lips, letting her voice rise to a whisper:

"Religion is the emulation of the adult by the child. Religion is the encystment of past beliefs: mythology, which is guesswork, the hidden assumptions of trust in the universe, those pronouncements which men have made in search of personal power, all of it mingled with shreds of enlightenment. And always the ultimate unspoken commandment is: "Thou shalt not question!" But we question. We break that commandment as a matter of course. The work to which we have set ourselves is the liberating of the imagination, the harnessing of imagination to humankind's deepest sense of creativity."

Slowly, a sense of order returned to Ghanima's thoughts. She felt her body trembling, though, and knew how fragile was this peace she had attained, and that blurring veil remained in her mind.

"Leb Kamai," she whispered. "Heart of my enemy, you shall not be my heart."

And she called up a memory of Farad'n's features, the saturnine young face with its heavy brows and firm mouth.

Hate will make me strong, she thought. *In hate, I can resist Alia's fate.*

But the trembling fragility of her position remained and all she could think about was how much Farad'n resembled his uncle, the late Shaddam IV.

"Here you are!"

It was Irulan coming up from Ghanima's right, striding along the parapet with movements reminiscent of a man. Turning, Ghanima

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thought: *And she's Shaddam's daughter.*

"Why will you persist in sneaking out alone?" Irulan demanded, stopping in front of Ghanima and towering over her with a scowl.

Ghanima refrained from saying that she was not alone, that guards had seen her emerge onto the roof. Irulan's anger went to the fact that they were in the open here and a distant weapon might find them.

"You're not wearing a stillsuit," Ghanima said. "Did you know that in the old days, someone caught outside the sietch without a stillsuit was automatically killed. To waste water was to endanger the tribe."

"Water! Water!" Irulan snapped. "I want to know why you endanger yourself this way. Come back inside. You make trouble for all of us."

"What danger is there now?" Ghanima asked. "Stilgar has purged the traitors. Alia's guards are everywhere."

Irulan peered upward at the darkening sky. Stars already were visible against a gray-blue backdrop. She returned her attention to Ghanima. "I won't argue. I was sent to tell you we have word from Farad'n. He accepts, but for some reason he wishes to delay the ceremony."

"How long?"

"We don't know yet. It's being negotiated. But Duncan is being sent home."

"And my grandmother?"

"She chooses to stay on Salusa for the time being."

"Who can blame her?" Ghanima asked.

"That silly fight with Alia!"

"Don't try to gull me, Irulan! That was no silly fight. I've heard the stories."

"The Sisterhood's fears . . ."

"Are real," Ghanima said. "Well, you've delivered your message. Will you use this opportunity to try again to dissuade me?"

"I've given up."

"You should know better than to try lying to me," Ghanima said.

"Very well! I'll keep trying to dissuade you. This course is madness." And Irulan wondered why she let Ghanima become so irritating. A Bene Gesserit didn't need to be irritated at anything. She said: "I'm concerned by the extreme danger to you. You know that. Ghani, Ghani . . . you're Paul's daughter. How can you . . ."

"Because I'm his daughter," Ghanima said. "We Atreides go back to Agamemnon and we know what's in our blood. Never forget that, childless wife of my father. We Atreides have a bloody history and we're not through with the blood."

Distracted, Irulan asked: "Who's Agamemnon?"

"How sparse your vaunted Bene Gesserit education proves itself," Ghanima said. "I keep forgetting that you foreshorten history. But my memories go back to . . ." She

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broke off; best not to arouse those shades from their fragile sleep.

"Whatever you remember," Irulan said, "you must know how dangerous this course is to . . ."

"I'll kill him," Ghanima said. "He owes me a life."

"And I'll prevent it if I can."

"We already know this. You won't get the opportunity. Alia is sending you south to one of the new towns until after it's done."

Irulan shook her head in dismay. "Ghani, I took my oath that I'd guard you against any danger. I'll do it with my own life if necessary. If you think I'm going to languish in some brick-walled Djedida while you . . ."

"There's always the Huanui," Ghanima said, speaking softly. "We have the deathstill as an alternative. I'm sure you couldn't interfere from there."

Irulan paled, put a hand to her mouth, forgetting for a moment all of her training. It was a measure of how much care she had invested in Ghanima, this almost complete abandonment of everything except animal fear. She spoke out of that shattering emotion, allowing it to tremble on her lips. "Ghani, I don't fear for myself. I'd throw myself into the worm's mouth for you. Yes, I'm what you call me, the childless wife of your father, but you're the child I never had. I beg you . . ." Tears glistened at the corners of her eyes.

Ghanima fought down a tightness in her throat, said: "There is another difference between us. You were never Fremen. I'm nothing else. This is a chasm which divides us. Alia knows. Whatever else she may be, she knows this."

"You can't tell what Alia knows," Irulan said, speaking bitterly. "If I didn't know her for Atreides, I'd swear she has set herself to destroy her own family."

And how do you know she's still Atreides? Ghanima thought, wondering at this blindness in Irulan. This was a Bene Gesserit and who knew better than they the history of Abomination? She would not let herself even think about it, let alone believe it. Alia must have worked some witchery on this poor woman.

Ghanima said: "I owe you a water debt. For that, I'll guard your life. But your cousin's forfeit. Say no more of that."

Irulan stilled the trembling of her lips, wiped her eyes. "I did love your father," she whispered. "I didn't even know it until he was dead."

"Perhaps he isn't dead," Ghanima said. "This Preacher . . ."

"Ghani! Sometimes, I don't understand you. Would Paul attack his own family?"

Ghanima shrugged, looked out at the darkening sky. "He might find amusement in such a . . ."

"How can you speak so lightly of this . . ."

"To keep away the dark depths,"

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Ghanima said. "I don't taunt you. The gods know I don't. But I'm not just my father's daughter. I'm every person who's contributed seed to the Atreides. You won't think of Abomination, but I can't think of anything else. I'm the pre-born. I know what's within me."

"That foolish old superstition about . . ."

"Don't!" Ghanima reached a hand toward Irulan's mouth. "I'm every Bene Gesserit of their damnable breeding program up to and including my grandmother. And I'm very much more." She tore at her left palm drawing blood with a fingernail. "This is a young body but its experiences . . . Oh, gods, Irulan! My experiences! No!" She put out her hand once more as Irulan moved closer. "I know all of those futures which my father explored. I've the wisdom of so many lifetimes, and all the ignorance, too . . . all the frailties. If you'd help me, Irulan, first learn who I am."

Instinctively, Irulan bent and gathered Ghanima into her arms, holding her close, cheek against cheek.

Don't let me have to kill this woman, Ghanima thought. *Don't let that happen.*

As this thought swept through her, the whole desert passed into night.

One small bird has called thee
From a beak streaked crimson.
It cried once over Sietch Tabr
And thou went forth unto
Funeral Plain.

—Lament for Leto II

Leto awoke to the tinkle of water rings in a woman's hair. He looked to the open doorway of his cell and saw Sabiha sitting there. In the half-immersed awareness of the spice, he saw her outlined by all that his vision revealed about her. She was two years past the age when most Fremen women were wed or at least betrothed. Therefore, her family was saving her for something . . . or someone. She was nubile . . . obviously. His vision-shrouded eyes saw her as a creature out of humankind's terranic past: dark hair and pale skin, deep sockets which gave her blue-in-blue eyes a greenish cast. She possessed a small nose and a wide mouth above a sharp chin. And she was a living signal to him that the Bene Gesserit plan was known—or suspected—here in Jacurutu. So they hoped to revive Pharaonic Imperialism through him, did they? Then what was their design to force him into marrying his sister? Surely, Sabiha could not prevent that.

His captors knew the plan, though. And how had they learned it? They'd not shared his vision. They'd not gone with him where life became a moving membrane in other dimensions. The reflexive and circular subjectivity of the visions which revealed Sabiha were his and his alone.

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Again, the water rings tinkled in Sabiha's hair and the sound stirred up his visions. He knew where he had been and what he had learned. Nothing could erase that. He was not riding a great Maker palanquin now, the tinkle of water rings among the passengers a rhythm for their passage songs. No . . . he was here in the cell of Jacurutu, embarked on that most dangerous of all journeys: away from and back to the *Ahl as-sunna wal-jamas,* from the real world of the senses and back to that world.

What was she doing there with the water rings tinkling in her hair? Oh, yes. She was mixing more of the brew which they thought held him captive: food laced with spice essence to keep him half in and half out of the real universe until he either died or his grandmother's plan succeeded. And every time he thought he'd won, they sent him back. The Lady Jessica was right, of course—that old witch! But what a thing to do. The total recall of all those lives within him were of no use at all until he could organize their data and remember it at will. Those lives had been the raw stuff of anarchy. One or all of them could've overwhelmed him. The spice and its peculiar setting here in Jacurutu had been a desperate gamble.

Now, Gurney waits for the sign and I refuse to give it to him. How long will his patience last?

He stared out at Sabiha. She'd thrown her hood back and revealed the tribal tattoos at her temples. Leto did not recognize the tattoos at first, then remembered where he was. Yes Jacurutu still lived.

Leto did not know whether to be thankful toward his grandmother or hate her. She wanted him to have conscious-level instincts. But instincts were only racial memories of how to handle crises. His direct memories of those other lives told him far more than that. He had it all organized now, and could see the peril of revealing himself to Gurney. No way of keeping the revelation from Namri. And Namri was another problem.

Sabiha entered the cell with a bowl in her hands. He admired the way the light from outside made rainbow circles at the edges of her hair. Gently, she raised his head and began feeding him from the bowl. It was only then he realized how weak he was. He allowed her to feed him while his mind went roving, recalling the session with Gurney and Namri. They believed him! Namri more than Gurney, but even Gurney could not deny what his senses had already reported to him about the planet.

Sabiha wiped his mouth with a hem of her robe.

Ahhh, Sabiha, he thought, recalling that other vision which filled his heart with pain. *Many nights have I dreamed beside the open water, hearing the winds pass overhead. Many nights my flesh lay beside the*

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snake's den and I dreamed of Sabiha in the summer heat. I saw her storing spice bread baked on red hot sheets of plasteel. I saw the clear water in the qanat, gentle and shining, but a stormwind ran through my heart. She sips coffee and eats. Her teeth shine in the shadows. I see her braiding my water rings into her hair. The amber fragrance of her bosom strikes through to my innermost senses. She torments me and oppresses me by her very existence.

The pressure of his multi-memories exploded the time-frozen englobement which he had tried to resist. He felt twining bodies, the sounds of sex, rhythms laced in every sensory impression: lips, breathing, moist breaths, tongues. Somewhere in his vision there were helix shapes, coal-colored, and he felt the beat of those shapes as they turned within him. A voice pleaded in his skull: "Please, please, please, please . . ." There was an adult beefswelling in his loins and he felt his mouth open, holding, clinging to the girdershape of ecstasy. Then a sigh, a lingering groundswelling sweetness, a collapse.

Oh, how sweet to let that come into existence!

"Sabiha," he whispered. "Oh, my Sabiha."

When her charge had clearly gone deeply into the trance after his food, Sabiha took the bowl and left, pausing at the doorway to speak to Namri. "He called my name again."

"Go back and stay with him," Namri said. "I must find Halleck and discuss this with him."

Sabiha deposited the bowl beside the doorway and returned to the cell. She sat on the edge of the cot, staring at Leto's shadowed face.

Presently, he opened his eyes and put a hand out, touching her cheek. He began to talk to her then, telling her about the vision in which she had lived.

She covered his hand with her own as he spoke. How sweet he was . . . how very sweet . . . She sank onto the cot, cushioned by his hand, unconscious before he pulled the hand away. Leto sat up, feeling the depths of his weakness. The spice and its visions had drained him. He searched through his cells for every spare spark of energy, climbed from the cot without disturbing Sabiha. He had to go, but he knew he'd not get far. Slowly, he sealed his stillsuit, drew the robe around him, slipped through the passage to the outer shaft. There were a few people about, busy at their own affairs. They knew him, but he was not their responsibility. Namri and Halleck would know what he was doing; Sabiha could not be far away.

He found the kind of side passage he needed and walked boldly down it.

Behind him, Sabiha slept peacefully until Halleck aroused her.

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She sat up, rubbed her eyes, saw the empty cot, saw her uncle standing behind Halleck, the anger on their faces.

Namri answered the expression on her face: "Yes, he's gone."

"How could you let him escape?" Halleck raged. "How is this possible?"

"He was seen going toward the lower exit," Namri said, his voice oddly calm.

Sabiha cowered in front of them, remembering.

"How?" Halleck demanded.

"I don't know. I don't know."

"It's night and he's weak," Namri said. "He won't get far."

Halleck whirled on him. "You want the boy to die!"

"It wouldn't displease me."

Again, Halleck confronted Sabiha. "Tell me what happened."

"He touched my cheek. He kept talking about his vision . . . us together." She looked down at the empty cot. "He made me sleep. He put some magic on me."

Halleck glanced at Namri. "Could he be hiding inside somewhere?"

"Nowhere inside. He'd be found, seen. He was headed for the exit. He's out there."

"Magic," Sabiha muttered.

"No magic," Namri said. "He hypnotized her. Almost did it to me, you remember? Said I was his friend."

"He's very weak," Halleck said.

"Only in his body," Namri said. "He won't go far, though. I disabled the heel pumps of his stillsuit. He'll die with no water if we don't find him."

Halleck almost turned and struck Namri, but held himself in rigid control. Jessica had warned him that Namri might have to kill the lad. Gods below! What a pass they'd come to, Atreides against Atreides. He said: "Is it possible he just wandered away in the spice trance?"

"What difference does it make?" Namri asked. "If he escapes us he must die."

"We'll start searching at first light," Halleck said. "Did he take a Fremkit?"

"There're always a few beside the doorseal," Namri said. "He'd've been a fool not to take one. Somehow, he has never struck me as a fool."

"Then send a message to our friends," Halleck said. "Tell them what's happened."

"No messages this night," Namri said. "There's a storm coming. The tribes have been tracking it for three days now. It'll be here by midnight. Already, communication's blanked out. The satellites signed off this sector two hours ago."

A deep sigh shook Halleck. The boy would die out there for sure if the sandblast storm caught him. It'd eat the flesh from his bones and sliver the bones to fragments. The contrived false death would

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become real. He slapped a fist into an open palm. The storm could trap them in the sietch. They couldn't even mount a search. And storm static already had isolated the sietch.

"Distrans," he said, thinking they might imprint a message onto a bat's voice and dispatch it with the alarm.

Namri shook his head. "Bats won't fly in a storm. Come on, man. They're more sensitive than we are. They'll cower in the cliffs until it's past. Best to wait for the satellites to pick us up again. Then we can try to find his remains."

"Not if he took a Fremkit and hid in the sand," Sabiha said.

Cursing under his breath, Halleck whirled away from them, strode out into the sietch.

Peace demands solutions, but we never reach living solutions; we only work toward them. A fixed solution is, by definition, a dead solution. The trouble with peace is that it tends to punish mistakes instead of rewarding brilliance.

—The Words of My Father,
An account of Muad'Dib
reconstructed by Harq al-Ada

"She's training him? She's training Farad'n?"

Alia glared at Duncan Idaho with a deliberate mix of anger and incredulity. The Guild Highliner had swung into orbit around Arrakis at noon local. An hour later, the lighter had put Idaho down at Arrakeen, unannounced, but all casual and open. Within minutes, a 'thopter had deposited him atop the Keep. Warned of his impending arrival, Alia had greeted him there, coldly formal before her guards, but now they stood in her quarters beneath the north rim. He had just delivered his report, truthfully, precisely, emphasizing each datum in mentat fashion.

"She has taken leave of her senses," Alia said.

He treated the statement as a mentat problem. "All the indicators are that she remains well balanced, sane. I should say her sanity index was . . ."

"Stop that!" Alia snapped. "What can she be thinking of?"

Idaho, who knew that his own emotional balance depended now upon retreat into mentat coldness, said: "I compute she is thinking of her granddaughter's betrothal." His features remained carefully bland, a mask for the raging grief which threatened to engulf him. There was no Alia here. Alia was dead. For a time, he'd maintained a myth-Alia before his senses, someone he'd manufactured out of his own needs, but a mentat could carry on such self-deception for only a limited time. This creature in human guise was possessed; a demon-psyche drove her. His steely eyes with their myriad facets available at will reproduced upon his vision centers a multiplicity of myth-Alias. But when he combined

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them into a single image, no Alia remained. Her features moved to other demands. She was a shell within which outrages had been committed.

"Where's Ghanima?" he asked.

She waved the question aside. "I've sent her with Irulan to stay in Stilgar's keeping."

Neutral territory, he thought. *There's been another negotiation with rebellious tribes. She's losing ground and doesn't know it . . . or does she? Is there another reason? Has Stilgar gone over to her?*

"The betrothal," Alia mused. "What are conditions in the Corrino House?"

"Salusa swarms with outrine relatives, all working upon Farad'n, hoping for a share in his return to power."

"And she's training him in the Bene Gesserit . . ."

"Is it not fitting for Ghanima's husband?"

Alia smiled to herself, thinking of Ghanima's adamant rage. Let Farad'n be trained. Jessica was training a corpse. It would all work out.

"I must consider this at length," she said. "You're very quiet, Duncan."

"I await your questions."

"I see. You know, I was very angry with you. Taking her to Farad'n!"

"You commanded me to make it real."

"I was forced to put out the report that you'd both been taken captive," she said.

"I obeyed your orders."

"You're so literal at times, Duncan. You almost frighten me. But if you hadn't, well . . ."

"The Lady Jessica's out of harm's way," he said. "And for Ghanima's sake, we should be grateful . . ."

"Exceedingly grateful," she agreed. And she thought: *He's no longer trustworthy. He has that damnable Atreides loyalty. I must make an excuse to send him away . . . and have him eliminated. An accident, of course.*

She touched his cheek.

Idaho forced himself to respond to the caress, taking her hand and kissing it.

"Duncan, Duncan, how sad it is," she said. "But I cannot keep you here with me. Too much is happening and I've so few I can completely trust."

He released her hand, waited.

"I was *forced* to send Ghanima to Tabr," she said. "Things are in deep unrest here. Raiders from the Broken Lands breached the qanats at Kagga Basin, spilled all of their waters into the sands. Arrakeen was on short rations. The Basin's alive with sandtrout yet, reaping the water harvest. They're being dealt with, of course, but we're spread very thin."

He'd already noted how few amazons of Alia's guard were to be seen in the Keep. And he thought: *The Maquis of the Inner Desert will*

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probing her defenses. Does she know that?

"Tabr is still neutral territory," he said. "Negotiations are continuing there right now. Javid's there with a delegation from the Priesthood. But I'd like you at Tabr to watch them, especially Irulan."

"She *is* Corrino," he agreed.

But he saw in her eyes that she was rejecting him. How transparent this Alia-creature had become!

She waved a hand. "Go now, Duncan, before I soften and keep you here. I've missed you so . . ."

"And I've missed you," he said, allowing all of his grief to flow into his voice.

She stared at him, startled by the sadness, then: "For my sake, Duncan." And she thought: *Too bad, Duncan.* She said: "Zia will take you to Tabr. We need the 'thopter back here."

Her pet amazon, he thought. *I must be careful of that one.*

"I understand," he said, once more taking her hand and kissing it. He stared at the dear flesh which once had been his Alia's. He could not bring himself to look at her face as he left. Someone else stared back at him from her eyes.

As he mounted to the Keep's roofpad, Idaho probed a growing sense of unanswered questions. The meeting with Alia had been extremely trying for the mentat part of him which kept reading data signs. He waited beside the 'thopter with one of the Keep's amazons, stared grimly southward. Imagination took his gaze beyond the Shield Wall to Sietch Tabr. *Why does Zia take me to Tabr? Returning a 'thopter is a menial task. What is the delay? Is Zia getting special instructions?*

Idaho glanced at the watchful guard, mounted to the pilot's position in the 'thopter. He leaned out, said: "Tell Alia I'll send the 'thopter back immediately with one of Stilgar's men."

Before the guard could protest, he closed the door, started the 'thopter. He could see her standing there indecisively. Who could question Alia's consort? He had the 'thopter airborne before she could make up her mind what to do.

Now, alone in the 'thopter, he allowed his grief to spend itself in great wracking sobs. Alia was gone. They had parted forever. Tears flowed from his Tleilaxu eyes and he whispered: "Let all the waters of Dune flow into the sand. They will not match my tears."

This was a nonmentat excess, though, and he recognized it as such, forcing himself to sober assessment of present necessities. The 'thopter demanded his attention. The reactions of flying brought him some relief and he had himself once more in hand.

Ghanima with Stilgar again. And Irulan.

Why had Zia been designated to accompany him? He made it a mentat problem and the answer

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chilled him. *I was to have a fatal accident.*

This rocky shrine to the skull of a ruler grants no prayers. It has become the grave of lamentations. Only the wind hears the voice of this place. The cries of night creatures and the passing wonder of two moons, all say his day has ended. No more supplicants come. The visitors have gone from the feast. How bare the pathway down this mountain.

—Lines at the shrine
of an Atreides Duke.
Anon.

The thing had the deceptive appearance of simplicity to Leto: avoiding the vision, do that which has not been seen. He knew the trap in this thought, how the casual threads of a locked future twisted themselves together until they held you fast, but he had a new grip on those threads. Nowhere had he seen himself running from Jacurutu. The thread to Sabiha must be cut first.

He crouched now in the last daylight at the eastern edge of the rock which protected Jacurutu. His Fremkit had produced energy tablets and food. He waited now for strength. To the west lay Lake Azrak, the gypsum plain where once there'd been open water in the days before the worm. Unseen to the east lay the Bene Sherk, a scattering of new settlements encroaching upon the open bled. To the south lay the Tanzerouft, Land of Terror: thirty-eight hundred kilometers of wasteland broken only by patches of grass-locked dunes and wind-traps to water them—the work of the Ecological Transformation remaking the landscape of Arrakis. They were serviced by airborne teams and no one stayed for long.

I will go south, he told himself. *Gurney will expect me to do that.* This was not the moment to do the completely unexpected.

It would be dark soon and he could leave this temporary hiding place. He stared at the southern skyline. There was a whistling of dun sky along that horizon, rolling there like smoke, a burning line of undulant dust—a storm. He watched the high center of the storm rising up out of the Great Flat like a questing worm. For a full minute he watched the center, saw that it did not move to the right or the left. The old Fremen saying leaped into his mind: *When the center does not move, you are in its path.*

That storm changed matters.

For a moment, he stared back westward, the direction of Tabr, feeling the deceptive gray-tan peace of the desert evening, seeing the white gypsum pan edged by wind-rounded pebbles, the desolate emptiness with its unreal surface of glaring white reflecting dust clouds. Nowhere in any vision had he seen himself surviving the gray serpent

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of a mother storm or buried too deeply in sand to survive. There was only that vision of rolling in wind . . . but that might come later.

And a storm was out there, winding across many degrees of latitude, whipping its world into submission. It could be risked. There were old stories, always heard from a friend of a friend, that one could lock an exhausted worm on the surface by propping a maker-hook beneath one of its wide rings and, having immobilized it, ride out a storm in the leeward shadow. There was a fine line between audacity and abandoned recklessness which tempted him. That storm would not come before midnight at the earliest. There was time. How many threads could he cut here? All, including the final one?

Gurney will expect me to go south, but not into a storm.

He stared down to the south, seeking a pathway, saw the fluent ebony brushstroke of a deep gorge curving through Jacurutu's rock. He saw sand curls in the bowels of the gorge, chimera sand. It uttered its haughty runnels onto the plain as though it were water. The gritty taste of thirst whispered in his mouth as he shouldered his Fremkit and let himself down onto the path which led into the canyon. It was still light enough that he might be seen, but he knew he was gambling with time.

As he reached the canyon's lip, the quick night of the central desert fell upon him. He was left with the parched glissando of moonglow to light his way toward the Tanzerouft. He felt his heartbeat quicken with all of the fears which his wealth of memories provided. He sensed that he might be going down into Huanui-naa, as Fremen fears labeled the greatest storms: the Earth's Deathstill. But whatever came, it'd be visionless. Every step left farther behind him the spice-induced dhyana, that spreading awareness of his intuitive-creative nature with its unfolding to the motionless chain of causality. For every hundred steps he took now, there must be at least one step aside, beyond words and into communion with his newly-grasped internal reality.

One way or another, Father, I'm coming to you.

There were birds invisible in the rocks around him, making themselves known by small sounds. Fremen-wise, he listened for their echoes to guide his way where he could not see. Often as he passed crannies, he marked the baleful green of eyes, creatures crouched in hiding because they knew a storm approached.

He emerged from the gorge onto the desert. Living sand moved and breathed beneath him, telling of deep actions and latent fumeroles. He looked back and up to the moon-touched lava caps on Jacurutu's buttes. The whole structure

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was metamorphic, mostly pressure-formed. Arrakis still had something to say in its own future. He planted his thumper to call a worm and, when it began beating against the sand, took his position to watch and listen. Unconsciously, his right hand went to the Atreides hawk ring concealed in a knotted fold of his dishdasha. Gurney had found it, but had left it. What had he thought, seeing Paul's ring?

Father, expect me soon.

The worm came from the south. It angled in to avoid the rocks, not as large a worm as he'd hoped, but that could not be remedied. He gauged its passage, planted his hooks and went up the scaled side with a quick scrambling as it swept over the thumper in a swishing dustspray. The worm turned easily under the pressure of his hooks. The wind of its passage began to whip his robe. He bent his gaze on the southern stars, dim through dust, and pointed the worm that way.

Right into the storm.

As First Moon rose, Leto gauged the storm height and put off his estimate of its arrival. Not before daylight. It was spreading out, gathering more energy for a great leap. There'd be plenty of work for the Ecological Transformation teams. It was as though the planet fought them with a conscious fury out here, the fury increasing as the Transformation took in more land.

All night he pressed the worm southward, sensing the reserves of its energy in the movements transmitted through his feet. Occasionally, he let the beast fall off to the west, which it was forever trying to do, moved by the invisible boundaries of its territory or by a deep-seated awareness of the coming storm. Worms buried themselves to escape the sandblast winds, but this one would not sink beneath the desert while maker-hooks held any of its rings open.

At midnight, the worm was showing many signs of exhaustion. He moved back along its great ridges and worked the flail, allowing it to slow down, but continuing to drive it southward.

The storm arrived just after daybreak. First, there was the beady, stretched-out immobility of the desert dawn pressing dunes one into another. Next, the advancing dust caused him to seal his face flaps. In the thickening dust, the desert became a dun picture without lines. Then, sand needles began cutting his cheeks, stinging his lips. He felt the coarse grit on his tongue and knew the moment of decision had come. Should he risk the old stories by immobilizing the almost exhausted worm? He took only a heartbeat to discard this choice, worked his way back to the worm's tail, slacked off his hooks. Barely moving now, the worm began to burrow. But the excesses of the creature's heat-transfer system still churned up a cyclone oven be-

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hind him in the quickening storm. Fremen children absorbed the dangers of this position near the worm's tail with their earliest stories. Worms were oxygen factories; fire burned wildly in their passage, fed by the lavish exhalations from the chemical adaptations to friction within them.

Sand began to whip around his feet. Leto loosed his hooks and leaped wide to avoid the furnace at the tail. Everything depended now on getting beneath the sand where the worm had loosened it.

Grasping the static compaction tool in his left hand, he burrowed into a dune's slipface, knowing the worm was too tired to turn back and swallow him in its great white-orange mouth. As he burrowed with his left hand, his right hand worked the stilltent from his Fremkit and he readied it for inflation. It was all done in less than a minute: he had the tent into a hard-walled sand pocket on the lee face of a dune. He inflated the tent and crawled into it. Before sealing the sphincter, he reached out with the compaction tool, reversed its action. The slipface came sliding down over the tent. Only a few sand grains entered as he sealed the opening.

Now, he had to work even more quickly. No sandsnorkel would reach up there to keep him supplied with breathing air. This was a great storm, the kind few survived. It would cover this place with tons of sand. Only the tender bubble of the stilltent with its compacted outer shell would protect him.

Leto stretched flat on his back, folded his hands over his breast and sent himself into a dormancy trance where his lungs would only move once an hour. In this, he committed himself to the unknown. The storm would pass and, if it did not expose his fragile pocket, he might emerge . . . or he might enter the *Madinat as-salam*, the Abode of Peace. Whatever happened, he knew he had to break the threads, one by one, leaving him at last only the Golden Path. It was that, or he could not return to the caliphate of his father's heirs. No more would he live the lie of that *Desposyni*, that terrible caliphate, chanting to the demiurge of his father. No more would he keep silent when a priest mouthed offensive nonsense: *"His crysknife will dissolve demons!"*

With this commitment, Leto's awareness slipped into the web of timeless dao.

There exist obvious higher-order influences in any planetary system. This is often demonstrated by introducing terraform life onto newly-discovered planets. In all such cases, the life in similar zones develops striking similarities of adaptive form. This form signifies much more than shape; it connotes a survival organization and a relationship of such organizations. The

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human quest for this interdependent order and our niche within it represents a profound necessity. The quest can, however, be perverted into a conservative grip on sameness. This has always proved deadly for the entire system.

—The Dune Catastrophe
After Harq al-Ada

"My son didn't really see *the future;* he saw the process of creation and its relationship to the myths in which men sleep," Jessica said. She spoke swiftly but without appearing to rush the matter. She knew the hidden observers would find a way to interrupt as soon as they recognized what she was doing.

Farad'n sat on the floor outlined in a shaft of afternoon sunlight which slanted through the window behind him. Jessica could just see the top of a tree in the courtyard garden when she glanced across from her position standing against the far wall. It was a new Farad'n she saw: more slender, more sinewy. The months of training had worked their inevitable magic on him. His eyes glittered when he stared at her.

"He saw the shapes which existing forces would create unless they were diverted," Jessica said. "Rather than turn against his fellow men, he turned against himself. He refused to accept only that which comforted him because that was moral cowardice."

Farad'n had learned to listen silently, testing, probing, holding his questions until he had shaped them into a cutting edge. She had been talking about the Bene Gesserit view of molecular memory expressed as ritual and had, quite naturally, diverged to the Sisterhood's way of analyzing Paul Muad'Dib. Farad'n saw a shadow play in her words and actions, however, a projection of unconscious forms at variance with the surface intent of her statements.

"Of all our observations, this is the most crucial," she'd said. "Life is a mask through which the universe expresses itself. We assume that all of humankind and its supportive life-forms represent a *natural* community and that the fate of all life is at stake in the fate of the individual. Thus, when it comes to that ultimate self-examination, the *amor fati*, we stop playing god and revert to teaching. In the crunch, we select individuals and we set them as free as we're able."

He saw now where she had to be going and, knowing its effect upon those who watched through the spy eyes, refrained from casting an apprehensive glance at the door. Only a trained eye could have detected his momentary imbalance, but Jessica saw it and smiled. A smile, after all, could mean anything.

"This is a sort of graduation ceremony," she said. "I'm very pleased with you, Farad'n. Will you stand, please."

He obeyed, blocking off her view

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of the treetop through the window behind him.

Jessica held her arms stiffly at her side, said: "I am charged to say this to you. 'I stand in the sacred human presence. As I do now, so should you stand someday. I pray to your presence that this be so. The future remains uncertain and so it should, for it is the canvas upon which we paint our desires. Thus always the human condition faces a beautifully empty canvas. We possess only this moment in which to dedicate ourselves continuously to the sacred presence which we share and create."

As Jessica finished speaking, Tyekanik came through the door on her left, moving with a false casualness which the scowl on his face belied. "My Lord," he said. But it was already too late. Jessica's words and the preparation which had gone before had done their work. Farad'n no longer was Corrino. He was now Bene Gesserit.

What you of the CHOAM directorate seem unable to understand is that you seldom find real loyalties in commerce. When did you last hear of a clerk giving his life for the company? Perhaps your deficiency rests in the false assumption that you can order men to think and cooperate. This has been a failure of everything from religions to general staffs throughout history. General staffs have a long record of destroying their own nations. As to religions, I recommend a rereading of Thomas Aquinas. As to you of CHOAM, what nonsense you believe! Men must want to do things out of their own innermost drives. People, not commercial organizations or chains of command, are what make great civilizations work. Every civilization depends upon the quality of the individuals it produces. If you overorganize humans, overlegalize them, suppress their urge to greatness—they cannot work and their civilization collapses.

—A Letter to CHOAM
Attributed to The Preacher

Leto came out of the trance with a softness of transition which did not define one condition as separate from another. One level of awareness simply moved into the other.

He knew where he was. A restoration of energy surged through him, but he sensed another message from the stale deadliness of the oxygen-depleted air within the stilltent. If he refused to move, he knew he would remain caught in the timeless web, the eternal now where all events coexisted. This prospect enticed him. He saw *Time* as a convention shaped by the collective mind of all sentience. Time and Space were categories imposed on the universe by this Mind. He had but to break free of the multiplicity where prescient visions lured him. Bold selection could change provisional futures.

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What boldness did this moment require?

The trance state lured him. Leto felt that he had come from the Alam al Mythal into the Universe of Reality only to find them identical. He wanted to maintain the Rihani magic of this revelation, but survival demanded decisions of him. His relentless taste for life sent its signals along his nerves.

Abruptly, he reached out his right hand to where he had left the sand-compaction tool. He gripped it, rolled onto his stomach and breached the tent's sphincter. A pool of sand drifted across his hand. Working in darkness, goaded by the stale air, he worked swiftly, tunneling upward at a steep angle. Six times his body-length he went before he broke out into darkness and clean air. He slipped out onto the moonlit windface of a long curving dune, found himself about a third of the way from the dune's top.

It was Second Moon above him. It moved swiftly across him, departing beyond the dune, and the stars were laid out above him like bright rocks beside a path. Leto searched for the constellation of The Wanderer, found it and let his gaze follow the outstretched arm to the brilliant glittering of Foum al-Hout, the polar star of the south.

There's your damned universe for you! he thought. Seen close up it was a hustling place like the sand all around him, a place of change, of uniqueness piled upon uniqueness. Seen from a distance, only the patterns lay revealed, and those patterns tempted one to belief in absolutes.

In absolutes, we may lose our way. This made him think of the familiar warning from a Fremen ditty: *Who loses his way in the Tanzerouft loses his life.* The patterns could guide and they could trap. One had to remember that patterns change.

He took a deep breath, stirred himself into action. Sliding back down his passage, he collapsed the tent, brought it out and repacked the Fremkit.

A wine glow began to develop along the eastern horizon. He shouldered the pack, climbed to the dune crest and stood there in the chill predawn air until the rising sun felt warm on his right cheek. He stained his eyepits then to reduce reflection, knowing that he must woo this desert now rather than fight her. When he had put the stain back into the pack, he sipped from one of his catchtubes, drew in a sputtering of drops and then air.

Dropping to the sand, he began going over his stillsuit, coming at last to the heel pumps. They had been cut cleverly with a needle knife. He slipped out of the suit and repaired it, but the damage had been done. At least half of his body's water was gone. Were it not for the stillsuit's catch . . . He

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mused on this as he donned the suit, thinking how odd it was that he'd not anticipated this. Here was an obvious danger of visionless future.

Leto squatted on the dunetop then, pressed himself against the loneliness of this place. He let his gaze wander, fishing in the sand for a whistling vent, any irregularity of the dunes which might indicate spice or worm activity. But the storm had stamped its uniformity upon the land. Presently, he removed a thumper from the kit, armed it and sent it rotating to call Shai Hulud from his depths. He moved off then to wait.

The worm was a long time coming. He heard it before he saw it, turned eastward where the earth-shaking susurration made the air tremble, waited for the first glimpse of orange from the mouth rising out of the sand. The worm lifted itself from the depths in a gigantic hissing of dust which obscured its flanks. The curving gray wall swept past Leto and he planted his hooks, went up the side in easy steps. He turned the worm southward in a great curving track as he climbed.

Under his goading hooks, the worm picked up speed. Wind whipped his robe against him. He felt himself to be goaded as the worm was goaded, an intense current of creation in his loins. Each planet has its own period and each life likewise, he reminded himself.

The worm was of a type Fremen called a "growler." It frequently dug in its foreplates while the tail was driving. This produced rumbling sounds and caused part of its body to rise clear of the sand in a moving hump. It was a fast worm, though, and when they picked up a following wind the furnace exhalation of its tail sent a hot breeze across him. It was filled with acrid odors carried on the freshet of oxygen.

As the worm sped southward, Leto allowed his mind to run free. He tried to think of this passage as a new ceremony for his life, one which kept him from considering the price he'd have to pay for his Golden Path. Like the Fremen of old, he knew he'd have to adopt many new ceremonies to keep his personality from dividing into its memory parts, to keep the ravening hunters of his soul forever at bay. Contradictory images, never to be unified, must now be encysted in a living tension, a polarizing force which drove him from within.

Always newness, he thought. *I must always find the new threads out of my vision.*

In the early afternoon his attention was caught by a protuberance ahead and slightly to the right of his course. Slowly, the protuberance became a narrow butte, an upthrust rock precisely where he'd expected it.

Now, Namri . . . now Sabiha, let us see how your brethren take to my presence, he thought. This was a

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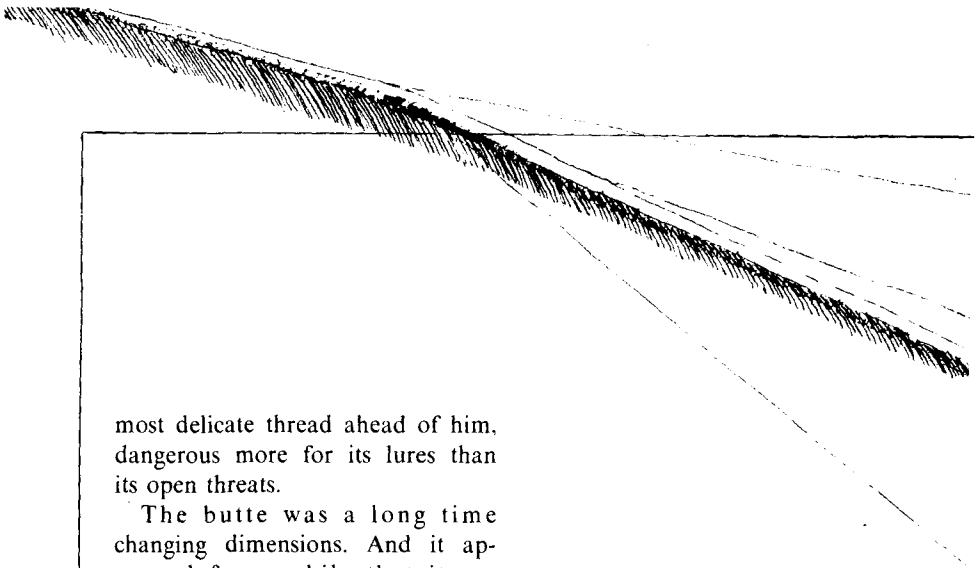

most delicate thread ahead of him, dangerous more for its lures than its open threats.

The butte was a long time changing dimensions. And it appeared for a while that it approached him instead of him approaching it.

The worm, tiring now, kept veering left. Leto slid down the immense slope to set his hooks anew and keep the giant on a straight course. A soft sharpness of melange came to his nostrils, the signal of a rich vein. They passed the leprous blotches of violet sand where a spiceblow had erupted and he held the worm firmly until they were well past the vein. The breeze, redolent with the gingery odor of cinnamon, pursued them for a time until Leto rolled the worm onto its new course, headed directly toward the rising butte.

Abruptly, colors blinked far out on the southern bled: the unwary rainbow flashing of a man-made artifact in that immensity. He brought up his binoculars, focused the oil lenses and saw in the distance the outbanking wings of a spice scout glittering in the sunlight. Beneath it, a big harvester was shedding its wings like a chrysalis before lumbering off. When Leto lowered the binoculars, the harvester dwindled to a speck and he felt himself overcome by the *hadhdhab*, the immense omnipresence of the desert. It told him how those spice hunters would see him, a dark object between desert and sky, which was the Fremen symbol for Man. They'd see him, of course, and they'd be cautious. They'd wait. Fremen were always suspicious of one another in the desert until they recognized the newcomer or saw for certain that he posed no threat. Even within the fine patina of Imperial civilization and its sophisticated rules,

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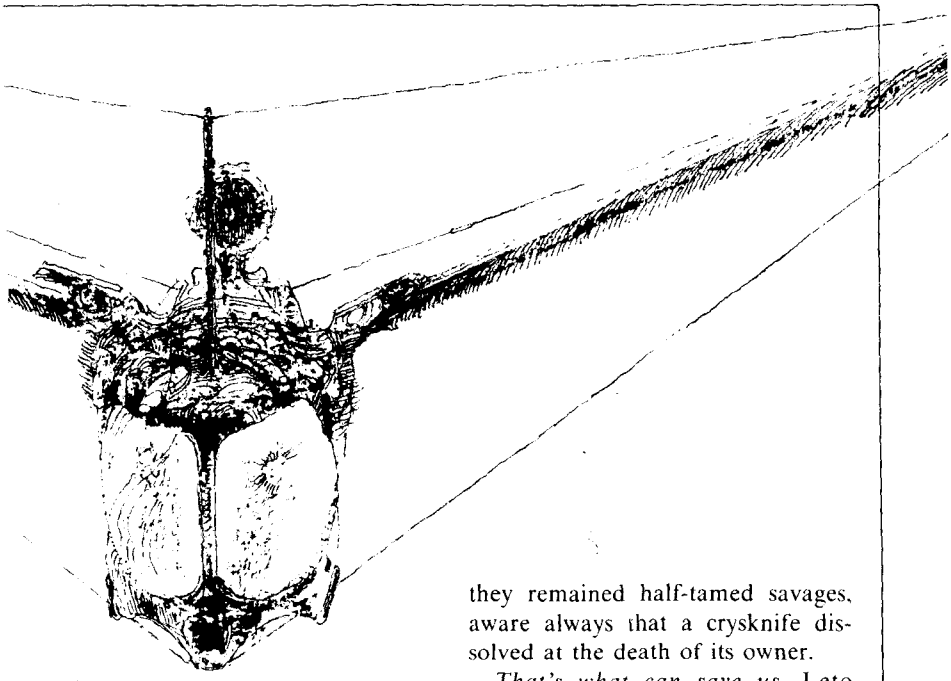

they remained half-tamed savages, aware always that a crysknife dissolved at the death of its owner.

That's what can save us, Leto thought. *That wildness.*

In the distance, the spice scout banked right, then left, a signal to the ground. He imagined the occupants scanning the desert behind him for sign that he might be more than a single rider on a single worm.

Leto rolled the worm to the left, held it until it had reversed its course, dropped down the flank and leaped clear. The worm, released from his goading, sulked on the surface for a few breaths, then sank its front third and lay there recuperating, a sure sign that it had been ridden too long.

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He turned away from the worm; it would stay there now. The scout was circling its crawler, still giving wing signals. They were smuggler-paid renegades for certain, wary of electronic communications. The hunters would be on spice out there. That was the message of the crawler's presence.

The scout circled once more, dipped its wings, came out of the circle and headed directly toward him. He recognized it for a type of light 'thopter his grandfather had introduced on Arrakis. The craft circled once above him, went out along the dune where he stood and banked to land against the breeze. It came down within ten meters of him, stirring up a scattering of dust. The door on his side cracked enough to emit a single figure in a heavy Fremen robe with a spear symbol at the right breast.

The Fremen approached slowly, giving each of them time to study the other. The man was tall with the total indigo of spice-eyes. The stillsuit mask concealed the lower half of his face and the hood had been drawn down to protect his brows. The movement of the robe revealed a hand beneath it holding a maula pistol.

The man stopped two paces from Leto, looked down at him with a puzzled crinkling around the eyes.

"Good fortune to us all," Leto said.

The man peered all around, scanning the emptiness, then returned his attention to Leto. "What do you here, child?" he demanded. His voice was muffled by the stillsuit mask. "Are you trying to be the cork in a worm hole?"

Again, Leto used traditional Fremen formula: "The desert is my home."

"Wenn?" the man demanded. *"Which way do you go?"*

"I travel south from Jacurutu."

An abrupt laugh erupted from the man. "Well, Batigh! You are the strangest thing I've ever seen in the Tanzerouft."

"I'm not your little Melon," Leto said, responding to *Batigh.* That was a label with dire overtones. The Little Melon of the desert's edge offered its water to any finder.

"We'll not drink you, Batigh," the man said. "I am Muriz. I am the Arifa of this taif." He indicated with a head motion the distant spice crawler.

Leto noted how the man called himself the *Judge* of his group and referred to the others as *taif,* a band or company. They were not *ichwan,* not a band of brothers. Paid renegades for sure. Here lay the thread he required.

When Leto remained silent, Muriz asked: "Do you have a name?"

"Batigh will do."

A chuckle shook Muriz. "You've not told me what you do here?"

"I seek the footprints of a worm," Leto said, using the religious phrase which said he was on

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hajj for *umra*, personal revelation.

"One so young?" Muriz asked. He shook his head. "I don't know what to do with you. You have seen us."

"What have I seen?" Leto asked. "I speak of Jacurutu and you make no response."

"Riddle games," Muriz said. "What is that, then?" He nodded toward the distant butte.

Leto spoke from his vision: "Only Shuloch."

Muriz stiffened and Leto felt his own pulse quicken.

A long silence ensued and Leto could see the man debating and discarding various responses. *Shuloch!* In the quiet story time after a sietch meal, stories of the Shuloch caravanserai were often repeated. Listeners always assumed that Shuloch was a myth, a place for interesting things to happen and only for the sake of the story. Leto recalled a Shuloch story: A waif was found at the desert's edge and brought into the sietch. At first, the waif refused to respond to his saviors, then when he spoke no one could understand his words. As days passed, he continued unresponsive, refused to dress himself or cooperate in any way. Every time he was left alone he made odd motions with his hands. All the specialists of the sietch were called in to study this waif, but arrived at no answer. Then, a very old woman passed the doorway, saw the moving hands and laughed. "He only imitates his father who rolls the spice fibers into rope," she explained. "It's the way they still do it at Shuloch. He's just trying to feel less lonely." And the moral: *In the old ways of Shuloch there is security and a sense of belonging to the golden thread of life.*

As Muriz remained silent, Leto said: "I'm the waif from Shuloch who knows only to move his hands."

In the quick movement of the man's head, Leto saw that Muriz knew the story. Muriz responded slowly, voice low and filled with menace. "Are you human?"

"Human as yourself," Leto said.

"You speak most strangely for a child. I remind you that I am a judge who can respond to the taqwa."

Ah, yes, Leto thought. In the mouth of such a judge, the *taqwa* carried immediate threat. Taqwa was the fear invoked by the presence of a demon, a very real belief among older Fremen. The Arifa knew the ways to slay a demon and was always chosen "because he has the wisdom to be ruthless without being cruel, to know when kindness is in fact the way to greater cruelty."

But this thing had come to the point which Leto sought and he said: "I can submit to the Mashhad."

"I'll be the judge of any Spiritual Test," Muriz said. "Do you accept this?"

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"Bi-lal kaifa," Leto said. *"Without qualification."*

A sly look came over Muriz' face. He said: "I don't know why I permit this. Best you were slain out of hand, but you're a small Batigh and I had a son who is dead. Come, we will go to Shuloch and I'll convene the Isnad for a decision about you."

Leto, noting how the man's every mannerism betrayed deadly decision, wondered how anyone could be fooled by this. He said: "I know Shuloch is the Ahl as-sunna wal-jamas."

"What does a child know of the real world?" Muriz asked, motioning for Leto to precede him to the 'thopter.

Leto obeyed, but listened carefully to the sound of the Fremen's footsteps. "The surest way to keep a secret is to make people believe they already know the answer," Leto said. "People don't ask questions then. It was clever of you who were cast out of Jacurutu. Who'd believe Shuloch, the story-myth place, is real? And how convenient for the smugglers or anyone else who desires access to Dune."

Muriz' footsteps stopped. Leto turned with his back against the 'thopter's side, the wing on his left.

Muriz stood half a pace away with his maula pistol drawn and pointed directly at Leto. "So you're not a child," Muriz said. "A cursed midget come to spy on us! I thought you spoke too wisely for a child, but you spoke too much too soon."

"Not enough," Leto said. "I'm Leto, the child of Paul Muad'Dib. If you slay me, you and your people will sink into the sand. If you spare me, I'll lead you to greatness."

"Don't play games with me, midget," Muriz snarled. "Leto is at the real Jacurutu from whence you say . . ." He broke off. The gun hand dropped slightly as a puzzled frown made his eyes squint.

It was the hesitation Leto had expected. He made every muscle indication of a move to the left which, deflecting his body no more than a millimeter, brought the Fremen's gun swinging wildly against the wing edge. The Maula pistol flew from his hand and, before he could recover, Leto was beside him with a crysknife pressed against his back.

"The tip's poisoned," he said. "Tell your friend in the 'thopter that he's to remain exactly where he is without moving at all. Otherwise, I'll be forced to kill you."

Muriz, nursing his injured hand, shook his head at the figure in the 'thopter, said: "My companion Behaleth has heard you. He will be as unmoving as the rock."

Knowing he had very little time until the two worked out a plan of action or their friends came to investigate, Leto spoke swiftly: "You need me, Muriz. Without me, the

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worms and their spice will vanish from Dune." He felt the Fremen stiffen.

"But how do you know of Shuloch?" Muriz asked. "I know they said nothing at Jacurutu."

"So you admit I'm Leto Atreides?"

"Who else could you be? But how do you . . ."

"Because you are here," Leto said. "Shuloch exists, therefore the rest is utter simplicity. You are the Cast Out who escaped when Jacurutu was destroyed. I saw you signal with your wings, therefore you use no device which could be overheard at a distance. You collect spice, therefore you trade. You could only trade with the smugglers. You are a smuggler, yet you are Fremen. You must be of Shuloch."

"Why did you tempt me to slay you out of hand?"

"Because you would've slain me anyway when we'd returned to Shuloch."

A violent rigidity came over Muriz' body.

"Careful, Muriz," Leto cautioned. "I know about you. It was in your history that you took the water of unwary travelers. By now, this would be common ritual with you. How else could you silence the ones who chanced upon you? How else keep your secret. Batigh! You'd seduce me with gentle epithets and kindly words. Why waste any of my water upon the sand? And if I were missed as were any of the others—well, the Tanzerouft got me."

Muriz made the *Horns-of-the-Worm* sign with his right hand to ward off the Rihani which Leto's words called up. And Leto, knowing how older Fremen distrusted mentats or anything which smacked of them by a show of extended logic, suppressed a smile.

"Namri spoke of us at Jacurutu," Muriz said. "I will have his water when . . ."

"You'll have nothing but empty sand if you continue playing the fool," Leto said. "What will you do, Muriz, when all of Dune has become green grass, trees and open water?"

"It will never happen!"

"It is happening before your eyes."

Leto heard Muriz' teeth grinding in rage and frustration. Presently, the man grated: "How would you prevent this?"

"I know the entire plan of the Transformation," Leto said. "I know every weakness in it, every strength. Without me, Shai Hulud will vanish forever."

A sly note returning to his voice, Muriz asked: "Well, why dispute it here. We're at a standoff. You have your knife. You could kill me, but Behaleth would shoot you."

"Not before I recovered your pistol," Leto said. "Then I'd have your 'thopter. Yes, I can fly it."

A scowl creased Muriz' forehead

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beneath the hood. "What if you're not who you say?"

"Will my father not identify me?" Leto asked.

"Ahhhh," Muriz said. "There's how you learned, eh? But . . ." He broke off, shook his head. "My own son guides him. He says you two have never . . . How . . ."

"So you don't believe Muad'Dib reads the future," Leto said.

"Of course we believe! But he says of himself that . . ." Again, Muriz broke off.

"And you thought him unaware of your distrust," Leto said. "I came to this exact place in this exact time to meet you, Muriz. I know all about you because I've *seen* you . . . and your son. I know how secure you believe yourselves, how you sneer at Muad'Dib, how you plot to save your 'little patch of desert.' But your little patch of desert is doomed without me, Muriz. Lost forever. It has gone too far here on Dune. My father has almost run out of vision, and you can only turn to me."

"That blind . . ." Muriz stopped, swallowed.

"He'll return soon from Arrakeen," Leto said, "and then we shall see how blind he is. How far have you gone from the old Fremen ways, Muriz?"

"What?"

"He is *Wadquiyas* with you. Your people found him alone in the desert and brought him to Shuloch. What a rich discovery he was! Richer than a spice vein. *Wadquiyas!* He has lived with you; his water mingled with your tribe's water. He's part of your Spirit River." Leto pressed the knife hard against Muriz' robe. "Careful, Muriz." Leto lifted his left hand, released the Fremen's face flap, dropped it.

Knowing what Leto planned, Muriz said: "Where would you go if you killed us both?"

"Back to Jacurutu."

Leto pressed the fleshy part of his own thumb against Muriz' mouth. "Bite and drink, Muriz. That or die."

Muriz hesitated, then bit viciously into Leto's flesh.

Leto watched the man's throat, saw the swallowing convulsion, withdrew his knife and sheathed it.

"Wadquiyas," Leto said. "I must offend the tribe before you can take my water."

Muriz nodded.

"Your pistol is over there." Leto gestured with his chin.

"You trust me now?" Muriz asked.

"How else can I live with the Cast Out?"

Again, Leto saw the sly look in Muriz' eyes, but this time it was a measuring thing, a weighing of economics. The man turned away with an abruptness which told of secret decisions, recovered his maula pistol and returned to the wing step. "Come," he said. "We tarry too long in a worm's lair."

TO BE CONCLUDED

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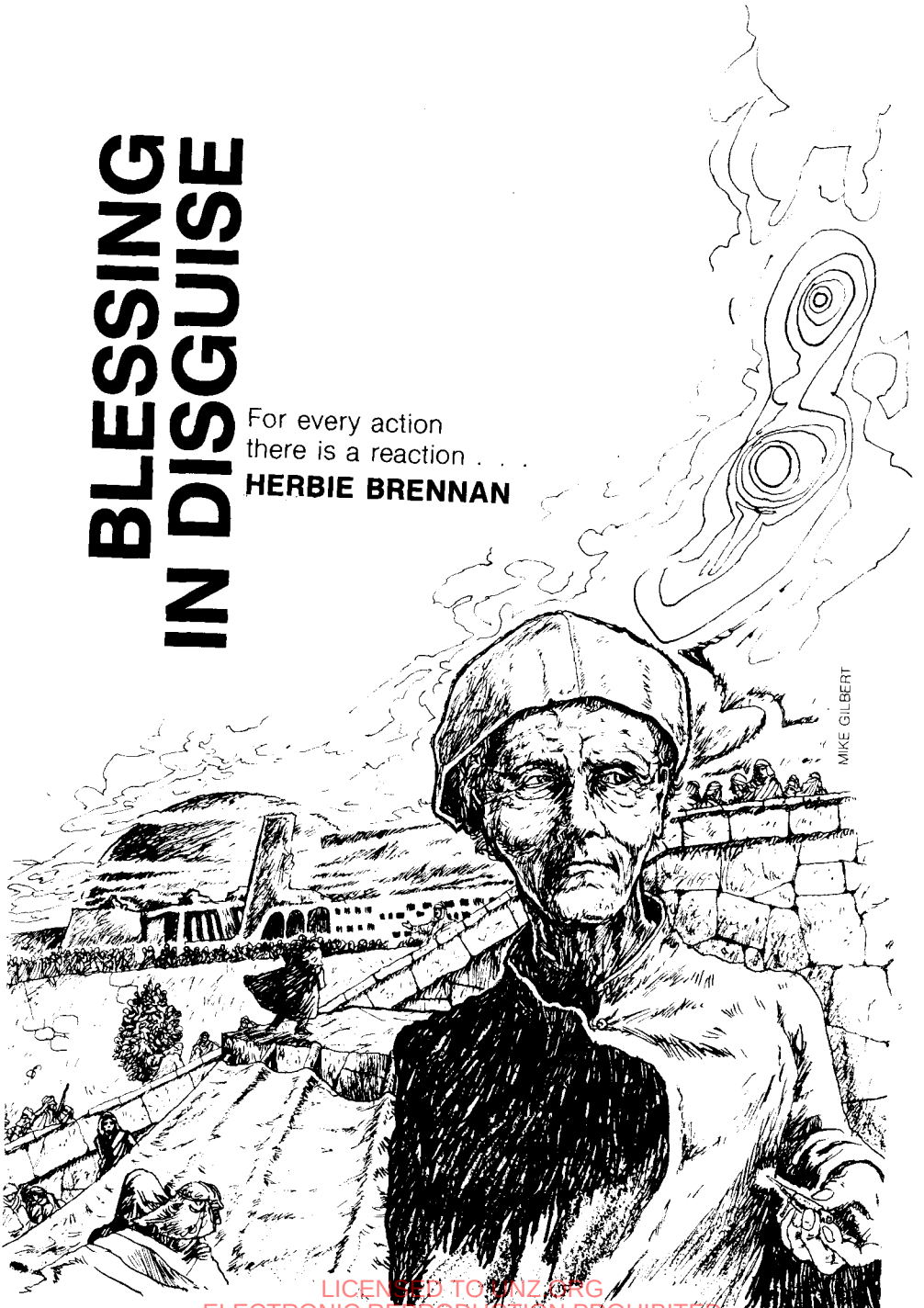
BLESSING IN DISGUISE

For every action
there is a reaction . . .

HERBIE BRENNAN



MIKE GILBERT

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Nearing sunset, which was the hour of Moslem prayer, Ramal pulled himself wearily to his feet and counted the discs in the wooden bowl. The ulcer on his shank had begun to ooze again, attracting stingflies. There was a tremor in his left hand, the one which held the bowl. It was not a great tremor. He ignored it as he ignored the ulcer. He would only pay attention to a seizure strong enough to rattle the discs in the bowl.

"Buy food, Ramal," the voice of his Master whispered in his ear.

Ramal shuffled off toward the market. He hugged the threadbare cotton robe around him, even though the air was oven hot. Distantly, the first high call of the muezzin alerted the Moslem Faithful to their duty.

The market was almost deserted. Only Jews and pale Outworlders remained to patronize the Jewish stalls. Ramal stopped beside a foodstall and pointed mutely to a loaf of black, coarse-grained bread.

"You want bread, old man?" the merchant asked. He leaned across and smiled into Ramal's face. "You have money to pay me, then?"

Ramal nodded. He did not meet the merchant's eyes. He was remembering his journey through the crystal desert. Tradition said the light reflections drove men mad, but he had come through with his sanity all right, hadn't he?

"Buy meat, Ramal," the voice of his Master said.

Ramal hesitated. It was forbidden for a pilgrim to eat meat on the journey.

"It is permitted," the voice of his Master told him kindly.

Perhaps it was because he had been ill with fever that an exception might be made. His body needed strength for the remainder of the journey. His mind slid off the problem back into the crystal desert. He pointed to a hanging sphere of yashak.

The merchant's eyebrows rose. "Meat? For a pilgrim?" He sneered and jerked the yashak from its hook. He tossed it down distastefully. Ramal picked it up and wrapped it, with the bread, in the folds of his robe. He counted out discs from the bowl.

"Aren't you going to bless me, meateater Pilgrim?" the merchant called derisively as he shuffled away.

"Buy ointment, Ramal," the voice of his Master whispered.

He was very tired and hunger gnawed his stomach, but he turned into the narrow street where he had seen an apothecary sign. He did not know what ointment he had to buy, but the Master would tell him when the time came. He hoped it might be ointment for his ulcer which, with the walking, was sending sharp stabs of pain deep into the bone.

He pushed through the hanging curtain and stood in the gloom of the apothecary's shop, assailed by

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spice and herbal smells. The apothecary emerged through strips of curling bluebark. "How may I serve you, old pilgrim?"

"We will buy an ointment composed of leban root," the voice of his Master said decisively. "We will also buy oil of cinnebar."

Wearily Ramal repeated the instructions. He was aware from long experience that only he could hear the voice of his Master. He waited, shoulders slumped, eyes downcast.

The apothecary vanished into the gloom of the back of the shop. He reappeared quite quickly with an open jar of greenish ointment. "The leban root," he said. He hesitated. "Oil of cinnebar is rare and costly, old one."

"Show him your discs," the voice of the Master ordered.

Ramal scrabbled in his bowl and held the remaining discs toward the apothecary. They glowed faintly in the gloom. The apothecary bent forward, counting. "You have enough," he said. He took a phial from his robe and handed it across with the ointment. "God go with you, venerable brother," he called as Ramal shuffled from the shop.

On the wasteground beside the Pilgrims' Road outside the town, Ramal sank down gratefully and stared out across the flat, arid plain. He waited, as he always waited, for the guidance of the Voice.

"Use the ointment on your leg ulcer," the voice of his Master said.

Ramal rubbed it in and felt the itching ease, if not the pain. When he had finished, he wiped his fingers on his robe.

"Sprinkle the oil of cinnebar on your meat," the voice of his Master ordered him eventually. "Seven drops each day until the phial is empty. But no more than seven drops."

He had difficulty opening the phial because of the tremor in his hand, but he managed it eventually and painstakingly counted seven drops onto the yashak. The dry, porous meat soaked it up instantly. Ramal capped the phial.

"Now eat," the voice of his Master said; and Ramal ate.

When the sun went down, Ramal slept with his head pillowed on his upturned bowl, his lean body curled on the baked earth beside the Pilgrims' Road. As he slept, he dreamed of the Messiah, and the Messiah had the voice of his Master.

On the Pilgrims' Road, he was overtaken by a trading caravan. Its leader was a huge Mongolian with brigand's features and an open smile. "Do you travel south, holy old one?"

It was obvious which way Ramal was traveling. He stared up at the man while the voice of the Master said, "He is your friend."

"I seek the Messiah's blessing in Boran La," Ramal mumbled. Despite his Master's reassurance, he

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felt afraid of this big man.

"Then travel with us and welcome," the Mongolian said. "We journey to Phagri—a step from Boran La."

He found Ramal a place on one of the carts between a sullen, half-imbecile boy and a brace of pregnant sows. It was not unusual for caravans to offer transport to a pilgrim. Hospitality to the devout was a custom; besides, it sometimes discouraged superstitious robbers. Lulled by the movement of the cart and the warmth of the pigs, Ramal dozed. Fragmentary visions came to him; snatches of boyhood conversations, the faces of women he had known long ago.

In the cool of the evening, the caravan made camp. Ramal shared the travelers' food around a small campfire. The others ate meat, but he was offered a tasteless vegetable stew. Anything else would have been an insult to a pilgrim.

Several of the travelers talked in muted tones of the Messiah. He was reputed lately to have cured a case of leprosy on the Plain of Parsha. Listening, Ramal wondered if His blessing might cure the ulcerated leg. He hoped so, for the pain remained despite the frequent applications of the ointment. He stared into the campfire, watching salamanders swim among the flames. Someone mentioned the Outworlders and the idle chatter grew a little strained, a little fearful. At one point the big Mongolian growled, "The Outworlders may need a lesson soon," and his listeners nodded in agreement. It was fashionable to say the Outworlders had distorted the Messiah's teachings.

When he was sure no one was paying him attention, Ramal stole away. Hidden behind the carts, he treated a piece of the remaining yashak with the oil of cinnebar and ate it slowly. The oil of cinnebar was to give him strength and rid him of the remnants of his fever. He knew that now, because the voice of his Master had told him so.

The caravan reached Phagri in sixteen days; but long before that it encountered straggling lines of pilgrims traveling, like Ramal, in search of the Messiah's blessing. Ramal watched them furtively, when he was sure he would not catch their eyes. Almost all, he knew, were destined only to receive collective blessing. He himself would be blessed personally by the Messiah, would feel the actual touch of His holy hands. The voice of his Master had told him that too.

The "step" from Phagri to Boran La was two days march, but Ramal was feeling stronger now and tackled the last lap of his journey gladly. He thought of the Messiah almost constantly now, the more so on the last half day of his journey when the voice of his Master no longer distracted him. It was the

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first time in many years that he had been without the Voice and he would have felt frightened had not his Master assured him he would return after the blessing had been received.

Ramal came in sight of the Pan Tang Monastery of Boran La late in the afternoon of his final day. It squatted, stark and solid, to the southeast of a sweeping plain. To the west of the monastery itself stretched the ruins of Bhani Tar, its crumbling plazas now a favorite camping spot for pilgrims. Ramal could see the smoke of their fires rising in thin streams. But he avoided the deserted city as the voice of his Master had instructed. Instead, he approached the monastery obliquely, taking the little-used goat path that wound through the rocky eastern sweep of the plain. And as his Master had promised, God gave him a sign. A Pan Tang monk, in the saffron robes of his Order, sat meditating in the shade of a massive boulder.

Ramal waited until the monk opened his eyes, then bowed politely. "I seek the Messiah's blessing, Inward One," he said.

The monk stared at him momentarily, then nodded. "You are the man Ramal." It was a statement rather than a question, but Ramal said, "Yes, Inward One." It did not occur to him to wonder how the man knew his name. The Pan Tang were great sorcerers and several in their Order had learned the dark secrets of entering another's mind: it was small enough magic in comparison with their greatest achievement—the creation of the Messianic line.

"It will be arranged," the monk said.

Ramal followed him toward the monastery, pleased that his Master's promises had been so gracefully fulfilled. Perhaps one day the greatest promise of all would come to pass and he would see his Master face to face.

They entered the monastery through an unguarded wooded door. Ramal panted slightly in his efforts to keep pace with the Pan Tang as they walked along a colonnade before turning down a gloomy corridor. The monk brought him to a smallish room. Several other pilgrims waited inside. They turned as he entered, with an air of nervous expectancy, but looked away when they discovered he was not the Messiah.

After a while, another Pan Tang entered, a lightly built, elderly man who nonetheless wore the crimson of the Order's Martial Masters. He stationed himself, head bowed, beside the door. Ramal began to mumble prayers. There was a tightness in his stomach he could not control, for the Messiah's blessing would be the peak of his existence. He knew this, although he did not know how he knew this, for not even the voice of his Master had

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told him how the blessing would be.

He had ended the first litany and was about to embark on the second when, without ceremony, the Messiah entered. He was flanked by two Pan Tang Devouts, the markings of their office tattooed on their foreheads. He was a tall man, slim and scarcely thirty-five, and His face was the face Ramal had seen so often in his visions. The hum of murmured prayer stopped abruptly at His entrance. The pilgrims pressed forward eagerly, Ramal amongst them. The Devouts made as if to keep the little group away, but the Messiah waved them back. He smiled. It was an infinitely gentle, infinitely knowing smile. He looked directly at Ramal. He gestured.

Awed by the fate which had chosen him to be the first, Ramal shuffled forward, no longer aware of his ulcerated leg or the weakness of his wasted limbs. He stood before the Messiah and bowed his head, mindful of his Master's instructions not to kneel. The Messiah reached forward and placed both hands on Ramal's forehead.

At once Ramal exploded into action. He jerked back violently, pivoted on his left foot and kicked upward viciously with his right. The blow caught the Messiah squarely in the face, jerking the head back with a snap that broke the vertebrae. For an instant the Messiah teetered, then fell heavily. His neck twisted grotesquely. He was dead before he hit the floor.

Ramal's body slumped again. His eyes lost their brief fire. He stood head bowed and only half aware of the figures racing toward him. The Martial Master was, of course, the first to reach him. Ramal was not even aware of the skillful nerve jab which robbed him of consciousness.

He awoke in a bed. There was an ache in his jaw and along the right side of his head. His thoughts felt furry and he had difficulty focusing his eyes. He sat up with an effort. There were no restraints. As he glanced around the room, he realized his throat was lightly bandaged and there was a small pain at the base of his spine. For some reason he thought about his right leg, but could not remember why.

"It would be wise to keep your movements to a minimum, Saran Chad."

His name was Saran Chad. He stared at the speaker, a Pan Tang Martial Master by his robes, seated on a cushion near the door.

"You have undergone surgery," the Pan Tang said. "Your body has almost recovered, but for a while your mind will be disturbed."

He assumed it was an aftereffect of the anesthetic, like the difficulty with his eyes. Why had they operated on him? Where was he, anyway? The room looked monastic, which would explain the presence of the Pan Tang. But what was he

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doing in a Pan Tang monastery?

"I don't remember," he said. His tongue felt thick, so that he slurred the words, as if he had been drinking alcohol.

"No," the monk said, "you would not."

Saran Chad lay back. He felt overwhelmingly tired. Before he quite realized what was happening, he slipped back into sleep.

An old man was bending over him when he awoke again. The old man's thoughts were clear as crystal, sweet and pure like the waters of a brook. They caressed the mind of Saran Chad refreshingly.

"You are the Abbot General of the Pan Tang," Saran Chad said. He smiled. It was pleasant to be in the presence of holiness.

The old man stepped back. "You recognize me?"

"I taste your thoughts," Chad said.

The Abbot nodded. "You have developed quickly. The operation was successful."

Behind him, two Devouts smiled and nodded. Behind them, Martial Masters smiled. Chad reached out and stroked their minds. Each one had a different flavor. He caught a name in one of them and its aura puzzled him. "Ramal . . . ?" he frowned. He looked at the Abbot. "Who is Ramal?"

The truth flowed into him before he heard the words. "Ramal was an artificial personality laid on the soul of Saran Chad," the Abbot said. "Ramal was an old, sick pilgrim whose only thought was to receive the Messiah's blessing."

The emotions in the room swelled like a counterpoint to the words. He could hear the sorrow wailing softly as violins. A vision of shocking violence came to him and he knew he had slain the Messiah. He leaned back and wept.

"Such emotions are unnecessary," the Abbot said. "Can the arrow accept guilt? Does one point the finger at a sword . . . or at the man who wields it? You were an instrument, Saran Chad."

It became clear. The Abbot's thoughts blended with those of the other Pan Tang in the room. The past, as they had reconstructed it, was revealed. Mysteries became clearer, if not clear. For a moment, Saran Chad was Ramal again. He

ANALYTICAL LABORATORY/DECEMBER 1975

Place	Title	Author	Points
1.	The Visible Man	Gardner R. Dozois	2.320
2.	The Bitter Bread	Poul Anderson	2.426
3.	Star Probe (Conclusion)	Joseph Green	2.529
4.	Unfaithful Recording	Bob Shaw	2.745
5.	Love for All and All for Love	Daniel P. Dern	3.916

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felt the frightened old man in his body, remembered once again the voice of his Master.

The Abbot held up something tiny and metallic between forefinger and thumb. "The receiver," he said. "It was implanted in the bony structure of your skull beside your ear. It relayed the voice of the spokesman of those who desired to kill the Messiah." He set the object down. "Our surgeons removed it."

"Why?" Chad whispered. He thought of the slim man with the gentle smile. "He was the holiest creature on our planet."

The Abbot shrugged. "Perhaps political considerations. The Messiah had a following on the Outworlds. There are many men who consider such a following potentially explosive—even among our own ranks, it seems, since you entered our monastery so easily."

"I was the instrument," Chad said, wondering.

"You were the instrument," the Abbot agreed. He sighed. "Our enemies were clever. They trained you well. They knew no ordinary assassin could reach the Messiah, for we had given Him the power to walk within men's minds. So they gave you a mind which showed only devotion. They gave you the mind of Ramal."

Remembering, Saran Chad searched the pseudopersonality of Ramal and emerged bewildered. He stroked the Abbot's thoughts. "Ramal could not kill."

The Abbot nodded in agreement. "That is so—but then he was not required to. Ramal's mission ended when the Messiah touched him to impart the blessing. At that instant, a second artificial personality took control. The personality of a killer."

And Saran Chad remembered. He stared within himself and saw the remnants of the monster, a thing out of time, careless of its own safety and welfare, trained to kill coldly, with terrifying efficiency, regardless of consequences, then retreat into oblivion. He closed his eyes. "Your enemies have won, Lord Abbot."

"Perhaps . . ."

Saran Chad opened his eyes again. "Perhaps?" The Abbot's thoughts had become oddly opaque, so that for the moment Saran Chad could not enter them. He waited.

The Abbot sighed again. "It is an open secret that the Pan Tang Order has created this planet's Messianic line. From our viewpoint, the Messiah is not essentially a man. He is an idea and an ideal. He is the embodiment of Pan Tang philosophy. He is the result of specialized Pan Tang training, the product of delicate physical and psychological awakening techniques. Now the old Messiah is dead, for his body is dead. But the body is the least important aspect of the Messiah—merely a vehicle of manifestation. We create the conditions and even-

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tually a new manifestation arises. It may take years, or even decades—we do not have full control of the process and there are aspects of it which bewilder even our most learned monks. But we know the Messiah will live again eventually."

"And perhaps be slain again," said Saran Chad. He felt anger at the men who had used him.

"It is a risk."

Saran Chad swung his feet from the bed to the floor. "Even as an instrument, Lord Abbot, I feel a grave responsibility for what has happened."

"That is a natural emotion," the Abbot said without inflection.

Fires began to smolder behind Chad's eyes. "A sword is double-edged," he whispered.

The Abbot's thoughts again became transparent and Saran Chad realized the old monk had been thinking as he thought himself.

Ramal bought food with some discs from his wooden bowl and shuffled out of Phagri on the pilgrims' road. There were blanks in his memory, as often happens with an old man, but they did not disturb him. His ulcerated leg had healed and he felt more energetic than he had in many years.

What did disturb him sometimes was a certain loneliness. The voice of his Master had not spoken now for many months. But when the loneliness came, he banished it with a thought of comfort. Was he not now on a second pilgrimage, a pilgrimage to meet his Master face to face? Would the day not shortly dawn when he would feel his Master's hands in blessing? ■

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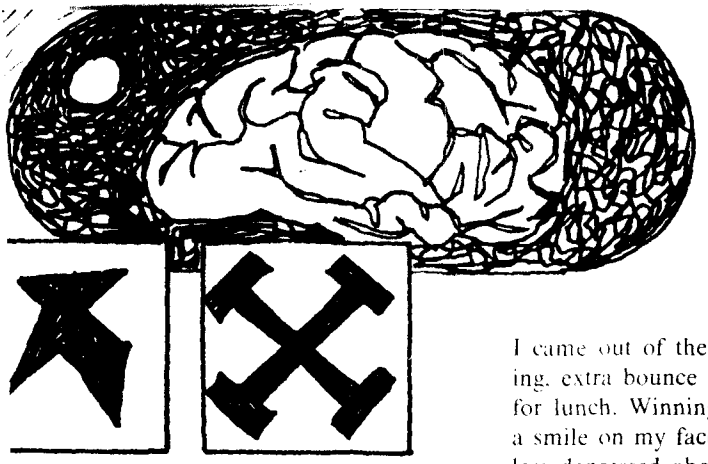

A PENNY'S WORTH

The legal system tries to preserve society's status quo, while scientific research always goes the other way.

STEPHEN ROBINETT

I came out of the courthouse smiling, extra bounce in my step, ready for lunch. Winning does that. I get a smile on my face. I feel generally less depressed about my lot in life. I eat too much.

On the way to my car, I even whistled, giving my briefcase a jaunty swing. I turned the corner into the parking lot. The whistling stopped. I stopped. The smile faded.

Some kid was standing next to my car looking furtive. Furtive. How often have I cross-examined the police on the meaning of that word? They had apprehended my innocent client in the act because he looked furtive. How many times have they wound up looking ridiculous, unable to say exactly what they meant by furtive? Still, there he was, standing on the driver's side of my Hudson Hummer, looking furtive.

Tall, thin, with too much hair all over the top of his head and an anxious expression all over his face, he gawked around the lot. Once or twice, he peered into the driver's seat, then quickly looked around.

Since I had just helped one thief walk out of the courtroom scot free, I thought it only proper to aid

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another one on his inevitable journey to San Quentin. Stealing from the public is one thing. Stealing from me is something else.

I turned back to the courthouse to hunt up the sheriff. Near the corner, I heard my name.

"Mr. Penny! Sirrrr!"

I stopped and turned around. The gangling thief hurried toward me, brushing a mass of sun-bleached curly hair off his forehead.

He walked up to me and stopped, then peered at my face as though trying to identify me from a vague description. He had freckles under his tan.

"You *are* Mr. Penny?"

"Last time I looked. What were you doing to my car?"

He looked blank, startled, slightly intimidated. "Your car? Nothing. I was just waiting for you. I didn't want to miss you. Can I talk to you?"

"On the way to the car." I started toward it. He easily kept pace with me, his long legs taking two steps to my three. "What do you want to talk about?"

"I want you to represent me."

"On what?"

"Assault and battery. I'll pay."

"That's a good omen." I glanced up at him. At close range, he looked very little like an assaulter or batterer. A car thief, possibly. A surfer, probably. But nonviolent. "Who'd you deck?"

"I *didn't*." He frowned at me, still looking nonviolent but irritated. "I didn't do it."

Another innocent victim of cruel police harassment. "How many witnesses were there?"

"Two—three if you count the man himself. But they're wrong."

"What did you hit him with?"

"The police *say* I hit him with a statue of some kind. But none of it's *true*. I hardly knew him. I didn't have any *rea*son to do it. I *didn't* do it. I had one of my headaches—"

I waved one hand at him, pushing aside the idea, momentarily silencing him. How often had I heard about headaches? They *all* have headaches, or most of them. They have this horrible headache. They black out. They wake up standing over the body with the smoking knife in their hand. They have *no* idea how they got there—for heaven's sake. "You'll have to do better than that headache routine. I've tried it. Juries never buy it."

"But it's *true*."

"You'll still have to do better."

We arrived at my car. I pressed my thumb to the lock ID. The door clicked. I opened it.

"Mr. Penny—"

"Get in."

"Where are we going?"

"To eat."

On the way to eat, he told me more about his headaches. For the previous month, they had gotten

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worse, severe, intense pain at the temples, blackouts of longer and longer duration. He thought they were starting to get shorter, but they were still bad. He sounded convincing.

Three days before, Saturday, he had sat down to spend the evening studying.

"You're a student."

"Grad student. Biochemistry. UC Irvine."

He felt a headache coming on. He had no more of the pills—

"What pills?"

"The pills Dr.—I mean, Mr. Winslow told me to take for the headaches."

He took two aspirin instead. No relief. The headache became so intense he quit studying. He lay on the couch, hoping the pain would pass. He dozed.

"Then I woke up in jail. In *jail.* I've never been in jail in my life. They said I went to this person's house—I don't even *know* the man, Mr. Penny. They say I asked to see him, waited quietly in his living room, then flew into a rage when I saw him. They say I grabbed this statue off the bookcase and tried to club him with it."

"You say you didn't."

"I say I blacked out."

"The headache."

"That's right. Will you defend me? At the arraignment this morning, they said I had two weeks to find a lawyer."

"Who did you hit?"

"*I* didn't hit *anyone.*"

"Who did they *say* you hit?"

"Someone named Dr. Morrow."

I knew Morrow slightly. "What did they charge you with? PC two forty and two forty-two?"

"What's that?"

"Assault and battery."

"I guess so. I've got the paper here."

He got out his copy of the complaint and handed it to me. I glanced at it, whistled and put it in my pocket. "Two forty-five."

He looked at me, sun-bleached eyebrows elevated, face quizzical. "Is that bad?"

"Is a felony worse than a misdemeanor? Is assault with a deadly weapon worse than simple assault and battery? Is ten years in the joint worse than six months in jail?"

"Ten *years!*"

"That's the maximum." I glanced at him. "You'd get less."

"How much less?"

"A few years."

He slumped in the seat. He shook his head, staring out the windshield. "Ten years for something I didn't do."

"Less if you're a good boy."

His voice took on a whining, pleading quality. "Mr. Penny, you've *got* to help me. I can't af*ford* ten years *or* six months. I finish my course work for my PhD this June. I have to write the dissertation. I can't af*ford* any time out."

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"They say prison's a good place to write."

"I don't *want* to write my dissertation in prison. Will you help me?"

"Ah, here we are."

I turned in at The Barrister, one of the few restaurants that let lawyers run up a tab. I parked and got out, waving for my new headache to follow.

Inside, after a courteous nod from Ricardo, we took up residence in my booth. Ricardo brought the menus and a phone. I called the office and told them to switch through anything important. I ordered a roast beef sandwich. He ordered coffee.

"That's it? Coffee?"

"I can't eat, Mr. Penny. I haven't been able to eat since I woke up in jail."

"Tell me about yourself."

He repeated what he had said, a PhD candidate in biochemistry at UC Irvine, formerly a part-time lab assistant, now unemployed. He divided his time between biochemistry and surfing, occasionally girls, though nothing permanent. "They always get upset because I study so much."

"That's probably why you get the headaches."

He thought about that a moment, decided I was joking and went on with the short history of his dull life. I got the picture of a diligent student who knew his field and little else.

"Have you ever been in trouble?"

"No! Never. Not even fights in school."

That was a bad sign. The ones who never fight in school slip a gear later. Still, he sounded like things were meshing properly. "OK, I'll take it. Three thousand in advance to represent you through the preliminary hearing. Three thousand more, plus expenses, if it goes to trial."

He swallowed hard, facing one of the unfortunate facts of life outside the test tube. He nodded. "All right. I'll have to have some time to borrow some of it. Actually, most of it."

I remained deaf to this plea of penury. "Tomorrow will do."

He nodded again. "All right, Mr. Penny. I'll try to have it tomorrow."

"There's one other thing."

"What's that?"

"What's your name?"

He told me his name—Marshal Pierce—and seemed to relax. He had done what he could. The rest was up to me. We finished lunch—he sipped his slowly—and left. I dropped him at his apartment, one of those modular globs the University defaced the landscape with in the mid-Eighties.

He thanked me profusely.

I told him to drop a cashier's check off at the office by five the next day.

Since I had anticipated that

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morning's trial lasting for several days, its abrupt and happy conclusion gave me some unexpected time. I decided to use it for Marshal Pierce. Usually, I wait for the check before acting. Pierce had a relatively honest face.

I drove down MacArthur toward the ocean. On a hill, just before I turned into Newport Center, I got a glimpse of Catalina Island. Someday, when I am rich, distinguished and elderly, I am going to buy a house on Catalina Island, remove myself from the travail of the world and become eccentric. The sooner, the better.

I parked the Hudson in the lot at the foot of a tall medical building and took the elevator up to the sixth floor. Suite 601, Charles Morrow, MD, surgeon. The waiting room was impressive, thick carpet, *objets d'art* here and there. A blond receptionist sat on the other side of a window to the inner office. She looked elegant, sophisticated, efficient. Her only touch of inefficiency—one too many buttons undone on her white uniform—added an effect of planned carelessness. She looked at me soberly through outsized hornrims.

I leaned on the counter, propped my chin on my palm and returned her steady gaze. "I'd like to see Dr. Morrow."

"Do you have an appoint—"

"No."

"What is it concern—"

"Personal."

"Dr. Morrow is extremely busy this morning. Could you—"

"No."

"Who shall I say—"

I gave her my card.

She glanced at it, let it register and looked at me. "An attorney."

I nodded. "You know, you're really a terrific-looking girl. Why do you wear those glasses?"

A trace of a smile surfaced and vanished on her lips. "They're window glass."

"I know."

"The doctor thinks they make me look more businesslike."

"They do. That's what's wrong with them."

The smile reappeared. "You're a nice man. I'll see what I can do."

She left the window. I watched her pad down the hall and into an office, a pleasant sight. After several minutes, she emerged, smiling.

She led me down the hall to Dr. Morrow's office.

"*Har*-ry," said Morrow, rising from behind his desk and starting toward me, hand outstretched. "What can I do for you?"

We shook hands. A big man, his hand enveloped mine. Stubby fingers. Good for detail work.

We returned to his desk. He sat behind it. I sat in front of it. Except for a slight softening of the jaw line, Morrow still radiated the look of a handsome, hard-working—expensive—young physician. The fact that he had radiated that look for at least fifteen years

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failed to diminish the impression.

"How's the meat-grinding business?"

He laughed. "If you're asking because you represent one of my patients and want to see how deep the pocket is before you file suit, business is crummy. If you're just being friendly, it's OK."

I looked around at the office, more plush, more *objets d'art*. "I'd say a little better than OK."

He looked at me a moment, suspicious. "You do represent one of my patients."

"No."

He relaxed. "OK, then why the visit after—how long?"

"Five years, I think. Since I incorporated you."

He shook his head. "Where does all the time go, Harry?"

I pointed at the small bandage just above his ear. "I represent the guy who did that."

His face clouded over. "Perce."

"Pierce."

He shook his head, frowning. "Harry, don't get him off. The kid's crazy. I've only seen him once or twice in my life. I've never even *talked* to him. Then he came to our home Saturday night and without a word flew into a rage. He tried to lay my head open with one of my best bronzes—Shang Dynasty, Harry. I hardly knew the kid. I *didn't* know the kid."

"At least you two agree on that. He says he doesn't know you either."

"Then why did he *do* it?"

"He says he gets headaches. He blacks out."

"And you believe him?"

"I try not to believe anyone. It simplifies my life."

He shook his head again. "Harry, you're the most cynical person I know."

"But lovable. Do you believe Pierce?"

"Be serious. He's a lunatic. I checked into his background after he did . . ." He touched the bandage above his ear. ". . . this."

"A hard-working graduate student who—"

"Was fired from his lab assistant job at Irvine."

"For what?"

"Stealing. He must think I was somehow involved in that, but I swear, Harry, I had nothing to do with it. I didn't even know his name until after the police took him away." He leaned forward. "You do believe that, don't you?"

I remained silent.

"OK, OK. I'll let you live your simple life. But it's true." He stood up, indicating the end of the interview. I stood up. We started toward the door. "You still driving that green Hudson, Harry."

"Best car I ever owned."

"Any trouble getting parts?"

"Haven't needed any. You should have picked up two or three while they were around. They came back once, they'll come back again."

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"I'm glad to see you're optimistic about something, Harry."

"There's always hope in the world."

We walked down the hall, pausing next to the receptionist. I glanced at her, talking to Morrow. "How's Nora?"

Momentarily uncomfortable, he finally spoke. "Fine."

I kept looking at the receptionist, a considerably more pleasant sight than Morrow. She winked at me. "What ever happened to Nora's first husband? What was his name?"

Morrow's voice became stiff. "Winslow. He died about a month ago. Heart attack, I believe."

I looked at him. "He was your partner, wasn't he?"

Morrow nodded. "Briefly. A very unstable man. Brilliant, probably, but unstable. Harry, I do have a lot of work to do."

I pushed open the door into the waiting room, glancing back and smiling. "OK, I'll let you get back to the meat-grinder."

I found a public phone next to the pharmacy on the ground floor, got Pierce's number from the operator, stuck in a quarter and dialed. It rang quite a few times. I began to think I would have to get a surfboard and hunt him up on the nearest wave. Finally, he answered. He came on the screen looking rumpled and awakened.

"Oh, Mr. Penny. I was sleeping. I didn't sleep at all in that jail."

"Morrow says he doesn't know you either."

His face brightened. "There. You see."

"No. But that's beside the point. Why were you fired from your lab assistant job?"

The bright face withered, "Who said—"

"Morrow."

"How—"

"He checked around. It seems to be common knowledge."

Pierce shook his head. "No, it's not common knowledge. He must have talked to Dr. Vernon. Dr. Vernon fired me."

"Why?"

He looked uncomfortable.

I repeated the question.

"He said I stole something from the laboratory."

"Did you?"

"I *took* something. I didn't *steal* it like a thief."

"What did you, eh, take?"

"It was just something for my headaches. It wasn't worth over a penny or two. I returned the bottle. Dr.—I mean, Mr. Winslow told me it would help. He used to give it to me. But when he passed away—"

"Ray Winslow?"

"Yes. Did you know him?"

"Only by reputation."

Pierce's face hardened. "That's what everybody else said, too, but they were wrong, Mr. Penny. Dr. Winslow was a brilliant man. I learned more working with him

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than I ever did working for Vernon."

I noticed the omission of the "Dr." before Vernon's name and the addition—or, rather, return—of "Dr." to Winslow's name. I wondered, briefly, whether they took away the "doctor" title when they took away a license to practice medicine. Pierce was still extolling Dr./Mr. Winslow's virtues.

"And he was a *good* man. I don't believe he would have done anything not in his patient's interest. He knew more about DNA reconstitution than Dr. Vernon. But there he was, making almost the same money I was, even sweeping out the damn trailers, while people who couldn't even under*stand* the kind of thing he worked with made ten, twenty times his income. I'm sure he was a good physician. I know he was a brilliant surgeon. He did most of Dr. Vernon's dissections. He told me once his partner caused it all. I'm sure that must have been true."

"Do you know his partner's name?"

"No. Why? Is it important?"

I shrugged. "So you got canned for steal—I mean, taking aspirin."

"It wasn't aspirin. It was an RNA compound of some kind. Dr. Winslow developed it especially for the kind of headaches I had. He used to give it to me when the headaches got too bad. When he died, I just took the bottle. Mr. Penny, you don't know what that kind of pain is like."

"Did it help?"

"Some. Not much. Dr. Winslow said it was a long-term cure."

"When did the blackouts start?"

"Just recently. I don't have any more of Dr. Winslow's medicine. That's probably why the pain's getting worse, but I don't think they last as long now. Maybe it did some good."

"OK. Take two aspirin, go to bed and *stay* there."

I hung up and called the District Attorney's office. Margie, their phone girl—pleasant enough girl in spite of her fetish for prosecutors—recognized me and put me through to the Deputy handling Pierce's case, George Fountain. Though I had never actually handled a case opposite Fountain, I knew him: young, aggressive, a man trying to kick the slats out of a few weary defense attorneys and make a reputation.

He came on the screen looking young, aggesssive, slat-kicking. "Harry, what's up?"

"I'm representing Marshal Pierce."

"Who?"

"PC two forty-five with a Shang-yin Dynasty bronze."

"Oh, that one." He reached to the side of the screen, punching up the file. He read it, thought, and looked at me. "We've got two witnesses, the victim's wife and a visiting neighbor. Your man came at mine with a will. He would have

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killed him if the neighbor and the wife hadn't laid him out with a chair."

"I saw Morrow today. He's–"

"Who's Morrow?"

"The victim."

He glanced at the file. "OK, Harry, I'm with you. They give me too many cases around here. After a while, all the victims and all the animals blend into one."

I smiled weakly at the joke. "Morrow has one small bandage on his head."

"One too many."

"What's it worth?"

"PC two forty-five–just like it's charged."

"Come on, George. Be serious. Two forty-five's a felony. My man's a graduate student–a serious person–you put him in the joint, it'll do bad things to his head. Instead of a biochemist, you'll have a bitter man. Do you want that?"

"I've seen bitter men before. They go around bitter, but they tend to obey the law."

"Have you seen your so-called deadly weapon?"

"No. Have you?"

"I know what a Shang bronze looks like. Nobody, not one of the twelve good men I'm going to ask for if this goes to trial, is going to believe that's a deadly weapon."

He smiled. "You're going to ask for a jury trial."

"Right."

"When was the last time you tried one, Harry?"

Why are prosecutors always like that? Obnoxious. They go to court every day. They know private attorneys go to court once a month, if that. They try to intimidate people with their Clarence Darrow expertise.

I shook my head. "This morning, George. He walked out a free man. The reason he walked out a free man, George, is because private attorneys, though they don't have every cop in the state as a potential investigator, *do* have time to prepare cases properly. We even remember the names of all the people involved in our cases. Now if you don't cut the crap about what an ace trial lawyer you are and start making noises like the reasonable man we all know you are, I am going to prepare this case like I was defending my own mother and ram it down your throat."

He thought about that, laughed once and nodded. "OK, Harry, sorry. What do you want?"

"What do you have?"

"Will he take a plea to two forty-two?"

"I don't know. Is that what you're offering?"

"A misdemeanor's better than a felony, I've heard."

"He won't take a day of time."

"*Harry,* I've got *two* witnesses." He held up two fingers, making a "V," emphasizing the point.

"My man gets headaches."

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"So do I. Your man's one of them."

"He blacks out."

He flapped his hand at the camera. "Get outta here with that crap, Harry. I believe your man gets blackouts like I believe you can't kill someone with a bronze statue."

"It doesn't matter what you believe, George. It matters what the jury believes."

"You said he'd take a plea on battery with no time and a fine, didn't you?"

"No. I said he'd *take* a dismissal. Beyond that, I didn't say. We may have to try it."

"You'll have to try the felony."

"But you'll take simple battery, no time and a fine."

"Harry, I didn't *say* that. I asked *you* that."

"Good. Let's sleep on it. See you, George."

I hung up and went back to the Hudson. Waiting for the boiler to heat and the steam tanks to charge, I stared at the front of Dr. Morrow's building and thought. As it stood, I might have been able to get Pierce a misdemeanor in exchange for a guilty plea. Jail time? I hate to see my former clients working along the side of the road in blue shirts with numbers stenciled on the back. But, unfortunately, George and his two damn witnesses were leaning toward giving Pierce a blue shirt.

I glanced at the chargetank indicator. Up. I pulled out of the lot, picked up MacArthur Boulevard and started for East Bluff Drive. Time to test George's eyewitnesses.

I parked in front of Dr. Morrow's house. I knew Nora Morrow better than her husband. In the late Eighties, when she was Nora Baker (before she became Nora Winslow), I dated her for about six months. I thought it was serious. At the time, she only dated medical students and law students, sizing each up for his profit potential, then dropping him when the bell on his cash register promised to ding too infrequently. For a while, she had me pegged as a big winner in the lottery of life. She, of course, was the prize. Then, abruptly, someone else's number came up. The rumor said a doctor—no mere student, medical, legal or otherwise. She married Dr. Raymond Winslow. Someplace along the line, the lucky Dr. Winslow lost his lottery ticket. She divorced him. She married his former partner.

I looked at the half-million-dollar home, a view of Newport Harbor, the Pacific, my future retreat on Catalina—all very impressive. Walking up the long drive to the front door, I could hear the cash register dinging.

Nora came to the door looking, frankly, older. The fresh complexion I remembered around the extraordinarily large brown eyes had given way to an excess of makeup. A few extra pounds showed in her

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face. No longer predatory, lean or hungry, she had let herself go. Having caught her fish, she was relaxing to clean it at her leisure.

"Fuzzy?" A quick smile, more pleasant than I remembered, appeared on her face, accenting the wrinkles around her eyes. "Is that really you, Fuzzy?"

Nothing wears less well than the stale endearments of vanished romance. During our brief encounter at the safedeposit box of love, she had transmuted my name from Harry Penny to Fuzzy Money, probably some unconscious connection with her inability to pin down—plus or minus a mill or two—my future lifetime gross earnings.

"It's me. I use Harry nowadays."

"I know. I've seen it in the papers. You're doing all right for yourself, all right. Married?"

"Not again. Can I come in?"

She looked appropriately embarrassed at her oversight and invited me in.

I followed her down the hall. Her figure, though heavier, still had enough left in it to catch another one if Morrow ran off with his receptionist, though Nora suffered by comparison. The hall showed the same taste as Morrow's office, plush accented by *objets d'art*. She led me into a living room with an ocean view and a museum atmosphere. They must have lived in some other part of the house, dusting the living room occasionally for visitors.

She sat on the couch and motioned for me to sit on the other end. She continued smiling, ready for a long chat. "Now, tell me what you've been doing."

"Representing Marshal Pierce."

The smile disappeared. She shook her head. "Oh, Harry, don't. I don't know what's wrong with that young man but *some*thing is. He came in here Saturday night—"

"In this room?"

"Yes. I thought he wanted to see Charles on business. He said he was from Dr. Vernon's laboratory—should I tell you this?"

"Sure. Why not?"

"The police and everything. And some man from the District Attorney's office. He said not to talk to anyone about it."

"It's perfectly proper for witnesses to talk to anyone."

She hesitated. "You're sure."

"Positive."

"All right. That young man just came in here and attacked Charles."

"Is the statue here?"

"The police took it. It's very valuable. I hope they're careful."

"With a little glue, it'll be as good as new."

"*Glue*—" She smiled. "You're joking."

"Tell me some more about Saturday night."

She shrugged. "That's all there is to tell. That boy came in here and

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attacked Charles. Our neighbor, Mr. Carlyle, hit the boy with a chair. I expected him to get up."

"He didn't."

"No." She gazed past me a moment, remembering Saturday night. "Such hatred, Harry. I don't think I've ever seen a face that showed that much hatred. He sounded—and *looked*, that was the striking thing, the way he looked." She broke off, remembering it.

"How did he look?"

She returned her attention to me. "It reminded me of Raymond and the scenes he used to make. What does that young man have against my husband, Harry? What does he have against him that would make him feel that much hatred?"

"He says he doesn't even know your husband."

She shook her head. "Harry, don't believe him. I saw his face and it looked like there was a lifetime of hatred in it. He would have *killed* Charles if he hadn't been stopped."

"Why did Winslow make scenes?"

She shifted uncomfortably on the couch. "I'd rather not talk about those things, Harry. I just used poor Raymond as an example. He's the only other person I've ever known capable of that much hatred, but—"

"But what?"

"Nothing. All that hatred died with Raymond."

We sat quietly for several moments. I glanced out the picture window. The wind had picked up, blowing in clouds, promising rain.

I kept watching the view, my head still turned away from her, talking in the direction of the window. "What happened to us, Nora?"

She was silent several seconds, probably putting up defenses, then, slowly, taking them down. "Why do you want to know?"

I looked at her. She looked beautiful. "Usually, you never get a chance to find out what happened. Someplace in the back of my mind, I always wanted to know. Was it just money?"

She lowered her eyes.

Looking at her, I became aware of the expensive dress, the jewelry, too much makeup, the extra weight in her face. It was just the money. "Never mind. The hell with it. I'm sorry I asked."

I stood up and started for the door. I stopped on the threshold, glancing back. "Nora, did Winslow have any reason other than the obvious one for hating your husband?"

"What's the obvious one?"

"You."

"Harry, it all died with Raymond and it has nothing to do with that boy. I'd rather forget it."

I went out to the car and drove back to the office. I kept mulling everything over—Pierce, Morrow, Winslow, Nora. None of it fit to-

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gether in a specific pattern, yet it all came from the same pot. Assuming everything everyone said was true—something I assumed only for the sake of argument—Winslow blamed Morrow for the loss of his medical license, his career and probably his wife, though Nora was perfectly capable of pulling up her own stakes when she saw the change drawer emptying out. The only connection between Pierce and Morrow—other than Dr. Vernon, who had employed Pierce and knew Morrow—was Winslow, now dead. He worked with Pierce and treated him for headaches. He hated Morrow. None of it made sense.

I crossed the bridge onto Balboa Island and turned in behind my office. Fortunately, no one had taken my parking place. During the summer, when the island attracts every tourist west of the Rockies, I have to post a guard on the parking place.

The girls—the receptionist, my secretary, my partner's secretary—were taking their afternoon break. They looked like they had been at it a while. They were deep into a conversation about which of our clients was the best-looking.

"Where's Bud?"

Dead silence. They had become aware of my presence. Bud's secretary, the newest of the three, a chunky, efficient brunette, gave me a self-conscious smile. "He's in court, Mr. Penny."

"Is he coming back today?"

"I don't think so."

"If he does, ask him to come in. I'm going into my office and ponder." I looked at my secretary. "Sharon, I'm in court, too."

"Yes, Mr. Penny."

I went into my office, hearing voiceprinters start up as my door closed.

I sat down behind my desk and pondered. Winslow. He seemed like an utterly peripheral figure in my man's attack on Morrow, yet he kept drawing all the pieces to him.

I got an outside line and tapped out the number of the public records computer in Sacramento. When the first index came on the screen, I found the code for the State Board of Medical Examiners and tapped it out. After several more indexes, I got close to what I wanted, disciplinary hearings. When I found *In re Winslow* and put in the code, the computer printed "Closed Hearing" on the screen.

I got out Pierce's copy of the complaint, tapped in the case number, followed by my state bar number, showing the computer it was a legal matter and that I could get a court order.

A human being came on the screen, a man. He glanced at something, then at me, verifying my identity. "Yes, Mr. Penny, what can I help you with?"

"I'd like a summary of Winslow's license hearing."

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"Is it relevant to this"—he glanced off camera again—"Pierce matter?"

"I don't know yet."

"Then I'm afraid—"

"Look, damn it, whatever your name is—"

"Slone."

"Mr. Slone, *you* know and *I* know I can get a court order. Why don't you save me time and my client money and—"

"Mr. Penny, I don't *know* you can get a court order. I don't *know* it until I see it. But I'm sure *you* know that pleasant attorneys get consideration here."

He had me. He knew it. I smiled. "OK. Sorry. Can I have a summary?"

He hesitated, tempted to waste my time and Pierce's money. Evidently, he decided I had become a pleasant attorney. "Would you like it on the screen or printed out?"

"Printout, please."

"Certified?"

"Not right now. Maybe when I read it."

He left the screen. The document feed light came on. A long tongue of phonefax paper extruded from the base of the phone. When it stopped, I tore it off and read it. I sat back to digest it, hands behind my head.

Winslow, according to every competent witness at the hearing, was some kind of surgical Einstein. He used a laser scalpel with such deft, precise strokes he frequently got applause from watching medical students. Innovative, imaginative, he had developed several "impossible" surgical procedures now considered standard practice.

So much for his competence. The hearing concerned a particular operation, a seven-year-old girl with a brain tumor. Winslow had performed his operation reluctantly. The tumor was located in Broca's area, the speech center of the brain. To remove it, along with a sufficient amount of the surrounding tissue to insure no recurrence, would leave the girl unable to speak.

Better speechless than dead, concluded Dr. Winslow. He operated. After the operation, he separated the cancerous tissue from the normal tissue, following procedures developed by Dr. Vernon. All the physicians on the hearing board made a big deal out of the fact that Dr. Vernon was a biochemist, not a physician.

At Dr. Winslow's request, Dr. Vernon made a computer analysis of the exact molecular structure of the normal tissue's DNA. Using the University's molecular synthesizer, Dr. Vernon produced RNA templates capable of generating exact duplicates of the original DNA. Hoping to aid recovery of the girl's speech function by reproducing the molecular structure of Broca's area in the remaining part of the brain,

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Dr. Winslow administered the synthetic RNA.

The girl recovered from the operation. Within a month, she regained ninety percent of her speech capability. The remaining ten percent developed more slowly. She left the hospital with no disability.

Why the hearing?

As the principal witness against Winslow—Dr. Charles Morrow—put it, concluding his remarks after a long series of complicated medical evidence, the operation was unnecessary. The tumor could have been reduced by chemotherapy. Dr. Winslow—asserted his friend, business partner and fellow surgeon—had performed an unnecessary operation solely to test his RNA procedure.

What, inquired the medical board, did Dr. Morrow think of the procedure itself?

The literature, answered Morrow, contained cases of one area of the brain taking over the function of another—damaged—area without medical intervention, especially with a child patient.

They believed Dr. Morrow—that an unnecessary operation had been performed to test a dubious technique. They also seemed interested in some of Winslow's former "brilliant successes."

I pushed back my chair, got up, stretched and went into the outer office.

"Sharon, I'm going out to UC Irvine to see some bird named Vernon. If Bud comes back, tell him I'm in court."

Why do parents do things like that to their children? I stared at the plaque on Dr. Vernon's trailer door and wondered. Dr. Vernon Vernon. Anyone with a name like Vernon Vernon had to get a PhD just to prove he was something more than just someone with a peculiar name.

I knocked. No answer.

I tried the door. Unlocked.

I stepped inside.

A chimp, squatting on a desktop, intent on watching Dr. Vernon write something in a notebook, looked up. Dr. Vernon continued to write.

"Dr. Vernon?"

A marmoset leaped across my field of vision, landing on the wire mesh of a cage and clinging. The cage rattled.

"Dr. Vernon?"

Backed into one corner of the trailer, next to a door connecting the trailer with a second trailer, an orangutan scowled at me, eating some sort of plant shoot. The chimp, hopping up and down on the desk, grinning with a folded-back lip and yelping, tried to get Dr. Vernon's attention.

Slowly, abstractedly, Dr. Vernon's hand reached out and patted the chimp, calming him. Dr. Vernon's eyes never left the notebook. "Stay calm, Rodney."

I appreciated Rodney's efforts.

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Rodney hopped off the desk and scampered to an open cage door, bounding off the floor and into the cage. He studied a panel of touch-plates inside the cage, selected two and pushed.

In front of Dr. Vernon, a chime sounded. He looked up. Conditioned? The small computer display in front of him read, "MAN HERE."

"Man here? What are you talking—" Dr. Vernon looked around, revealing a low forehead with a face strikingly like the orangutan's. He looked me up and down, absorbing my presence. "So there is, Rodney. So there is."

Dr. Vernon touched a plate on the computer. In the cage, a treat clinked down a chute into Rodney's waiting palm. He ate it, gave a folded-lip smile and hopped out of the cage. He noticed the orangutan in the corner and went over to talk to him.

I did the same with Dr. Vernon, introducing myself and sitting on the chair next to his desk. I asked about Marshal Pierce. Dr. Vernon's face became more simian than ever, eyebrows bunching, his scowl matching the orangutan's. "A thief."

"What did he steal?"

"Chemicals."

"Any particular kind of chemicals?"

His scowl became a look of suspicion. "Why do you want to know?"

"I'm defending him on that Dr. Morrow business."

He nodded, satisfied with some insight of his own. "I thought you looked like a lawyer."

"Any particular kind of chemicals?"

"Synthetic RNA."

"For his headaches."

"So he said, but I've never heard of RNA curing headaches. It may *cause* a few, but I seriously doubt it will cure them."

"Dr. Winslow thought it might help."

His look of suspicion disappeared. He smiled. "Really? Did you know Ray?"

"No. He told Pierce to take it for his headaches."

Dr. Vernon looked puzzled. "Very strange. Doesn't sound like him at all. He must have had some reason. Let me think a moment."

I let him think. Over his shoulder, I noticed the orangutan punch the chimp, who let out a yelp and retreated out of range. Dr. Vernon, thinking, seemed to hear nothing. I understood why he failed to hear me call his name.

Finally, he shook his head. "No, that makes no sense at all. Ray would never say such a thing. Either Pierce made it all up or he got the wrong bottle. I suspect that's the answer. He got the wrong bottle."

"Dr. Winslow did use RNA in the operation that got his license jerked, didn't he?"

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Dr. Vernon pushed aside the idea. "Different purpose altogether, Penny. Can't compare the two. His use of my RNA techniques with that little girl was brilliant. Those fools in the medical establishment are only *now* beginning to recognize *how* brilliant. Even Morrow has been around here asking about it. Poor Ray just about attacked Morrow himself the first time he showed up. I imagine that's why Pierce attacked Morrow. Pierce was very fond of Ray." He looked at me, face sincere. "Frankly, Penny, I felt very upset about everything that happened during the last few years of Ray's life, even guilty. My technique was responsible for it all. I felt I had to give Ray the job here. Unfortunately, I couldn't get more money for him. Damn shame, brilliant man like that, his career ruined by ignoramuses. It was the least–and, unfortunately–the most I could do for him. As you might guess, he took the situation badly."

"Do you mind if I ask about your technique? I understand it has to do with synthesizing RNA. Beyond that, I'm a little vague."

"Learning research, Penny."

"Learning research?"

He sat back, preparing to tell me about it. I realized–too late–I had a talker, a man who spent most of his time with chimps and took any opportunity available to talk. "One day–*years* ago–I was lecturing to my students. I had my pointer out and I was referring to charts and trying to base my remarks on their textbooks, showing them how the textbook material could be extended to numerous areas. In the back of my mind, I began to notice something. It was a strange experience, unsettling. I don't think I ever actually noticed anything like it before."

"What was it?"

"My students. I really looked at them for the first time in my life. Do you have any idea what I saw?"

"Blank stares," I suggested.

"*Right!*" He looked momentarily puzzled. "How did you know?"

"I was a student once."

"Ah, I see. Anyway, talk about a *tabula rasa*! You couldn't have written anything on those faces with a chisel. *Why*, I asked myself, *why?*"

"Why?"

"Because they couldn't *read*, Penny. Here I was referring to this textbook and none of them had read it. They were raised with movies and holovision and music but not with *words*. Have you ever listened to a student talk? They hem and haw and beat around the bush like English was a foreign language to them. And their *written* examinations–good *God!*" He gestured behind him. "*Rod*ney could do better! So you know what I did?"

"You taught them to read."

"No. I got an idea. I may be old-

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fashioned. I may prefer Shakespeare to the latest holohero." He broke off. "Who *are* they idolizing nowadays?"

"Millicent Verdant, Mars Commander is quite popular."

"Oh, yes, that one. The girl who goes around naked except for a web belt, a holster and a deathray, isn't it?"

"I believe that's her."

"Anyway, I may prefer the classics, the enduring, universal and eternal to the ephemeral. I may prefer Bach and The Beatles to Harvey Highwire and the Twangers–Have you ever *heard* Harvey Highwire?"

"Once."

"Utterly incomprehensible. I may, as I say, be old-fashioned, but I am not hidebound. Reading is only one means to an end, a method for getting information from one mind to another. The art itself may vanish as completely as the art of Russian icon painting, but needs must civilization vanish with it, sinking into a sea of barbarism without a trace? Did that *have* to be, Penny?"

I took a guess. "No."

"*Right! No* is the answer you give and *no* is the answer I now give. But at the time, I hesitated. I looked at that panorama of blank stares and empty minds. I looked at it and fear gripped me. My pointer dropped. I knew the terror the Romans knew in 410 AD when the barbarians sacked Rome. Spread out in those faces I saw the future and I was afraid. Fear had me. Fear compelled me. There is no fear so totally profound, so shaking to one's basic beliefs as the fear generated by intellectual insight."

"Chicken Little proved that."

"In*deed!* In*deed!* Then I saw the answer."

"What was it?"

"I'll show you."

He stood up and led me past Rodney and the orangutan to another compartment. In the center of the room, a large table held a rat maze, a complicated structure with movable baffles and a glass top. A stack of cages against one wall held several dozen mice, eating, sticking their noses through the wire, running inside exercise wheels.

Dr. Vernon opened a cage and extracted a mouse by the nape of the neck. It squealed, legs frantically clawing the air. He turned around, dangling it before my eyes by two fingers.

"This," he said, "is a mouse."

It was. I nodded agreement.

"A left-handed mouse."

I looked more closely. It continued clawing the air, possibly favoring the left claw. "I'd say left-clawed."

"Perhaps you would. The point is, he only makes left turns. I've conditioned him that way. The maze is set up for left turns. If he makes only left turns, he will arrive

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successfully at the other end and receive his reward. Watch."

He opened a small door at one end of the maze and shoved in the mouse. I stepped up to the table to watch.

The mouse shot down a long corridor, turned left, took a few steps to an intersection, turned left, traversed a medium-length passage, turned left. Behind him, baffles silently closed. In front of him, baffles silently opened. The combination allowed him to progress across the table top by a series of left turns. He reached the end. A light came on. A chime sounded. A reward tumbled into space before his pink nose. He ate it.

"Now," said Dr. Vernon, removing the left-clawed mouse through another small door, "let me set up the maze for a right-handed mouse."

"I'll take your word for it. The left-clawed mouse couldn't run it."

"Correct, but watch this."

He replaced the left-clawed mouse, got out another one, turned it over and shook his head. "No, confound it, this one's faded out already."

He replaced it and selected another from the next cage, giving it an exasperated look. "This one will have to do."

He held it up.

"A right-clawed mouse," I said.

"By training, education and birth."

He inserted the mouse into the maze, still in its left-turn mode. The mouse ran down the first corridor, turned left, got to the first intersection, turned left, shot down the medium-length passage.

Dr. Vernon, overcome by the sight of it, thumped the glass cover of the maze with his fist. "*Go,* you little devil!"

The mouse, hearing the thump, stopped, looked heavenward, then continued his journey, turning left.

"You're sure that's a right-clawed mouse. He seems to be turning left a lot."

"Positive."

Half-way through the maze, the mouse stopped at an intersection.

Dr. Vernon's delight vanished. He scowled.

The mouse, hesitating, looked right and left.

"He's fading," said Dr. Vernon, annoyed.

The mouse chose, turning right, stopping abruptly in a cul-de-sac and waiting.

Dr. Vernon touched a button. The glass top slid aside. He plucked out the mouse by the tail, angry with it, talking to it as he returned it to its cage. "You would do that right now, wouldn't you, you little devil?"

"Do what?"

He deposited the mouse in its cage. "Fade out."

"What's that mean?"

Fatal question. He led me back to his office compartment (Rodney had returned to the desk, the

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orangutan still sat in the corner) and offered me the chair next to his desk. I sat on it. He got out several loose-leaf binders and began showing me pages of computer-printed symbols, for the most part mathematics and chemistry. He assumed I knew more than I did. Rather than interrupt, I listened, hoping to get the gist of it.

The gist, along with most of the math and chemistry, eluded me. My attention wandered. Something moved in the waste basket next to his desk. I looked closely. A tiny hand emerged from the crumpled balls of paper, then an arm, followed by a second hand. A marmoset face surfaced and looked at me.

". . . so you see, Mr. Penny–Penny?"

"Oh, sorry." I returned my attention to Dr. Vernon.

"So you see, I can't really pinpoint the *cause* yet, but the effect is clear enough." He tapped a computer-printed chart entitled "Right-handed Mice," the incidence of left turns plotted vertically and right turns horizontally. The chart formed a bell-shaped curve. "I think it has something to do with phosphorylation."

"I see." I didn't, but I try to be polite.

He gazed at the chart, musing. "Adenosine triphosphate."

"Pardon me?"

He looked at me, raising his arms to chest level, fingers interlocked like an isometric exercise. "The whole molecular"–the hands released each other, letting the arms fly apart–"bond-breaking process, adenosine triphosphate to adenosine diphosphate releases energy for metabolic processes like protein construction from amino acids, in turn made out of DNA from RNA templates. You've read Dylan Thomas, 'The force that through the green fuse drives the flower.'" He looked puzzled a moment, scratching his head. Rodney, watching him, did the same. "Or was it T.S. Eliot?" He shrugged. Rodney shrugged, folded back his lip and laughed. "Whoever it was, 'The force that through the green fuse drives the flower' is adenosine triphosphate."

"I thought it was chlorophyll."

"Without ATP, chlorophyll would just sit there, green and useless. In any case, we were not talking about plants. We were talking about animals."

I had ceased to believe *we* were talking about anything. *He* was talking about everything. He was also the only one in the room, other than Rodney, capable of understanding it. We had come a long way from Pierce's attack on Dr. Morrow, almost as far as from why-Johnny-can't-read, or, rather, what Dr. Vernon proposed to do about it. I decided to push him back toward the subject.

I waited for a transition point in his monologue, found it, started to

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say something, but—too late. The transition flashed past as quickly as it had come, moving us from molecular bonding to evolution, not of species, but of molecules.

"The bigger the protein molecule," continued Dr. Vernon, "the more energy is needed to build it, right? From an evolutionary point of view, the large protein molecules antedate the smaller ones. Thus, though the larger molecules work perfectly well, nature, moving in crabwise evolution to perfection—"

"That's a striking phrase."

"Thank you. I often use it in class." He picked up where he had left off: "—to perfection, produced, in later years, smaller molecules requiring less energy to construct. In short, a more efficient system."

I saw an opening and dove for it. "How does that help your students learn better?"

"It doesn't. But let's not talk about them, poor devils."

I tried to force home my opening wedge. "But it *was* their learning problems that sparked your idea."

"In*deed*, in*deed*."

"And how will your process help?"

He looked at me, deadpan, thinking, organizing his thoughts. For one hopeful second, I began to believe he would actually tell me, simply and succinctly, the answer.

"I'll show you."

He glanced at Rodney. "In the cage, Rodney." He looked at the orangutan, "You, too, Boris."

The chimp leaped from the table, grabbing the wire mesh above the cage and swinging through the open door feet first. The orangutan remained in the corner.

"*Boris*, damn it, get in the cage!"

Boris gave a quick look around, suspicious and apprehensive, then darted to the cage below Rodney's, a cage also equipped with a touch-plate display.

Dr. Vernon locked Boris' cage. "Now, somewhere outside this trailer is the janitor's dog, Killer."

"That's the dog's name?"

"That's right, a German shepherd and—"

"Mean."

"No, actually quite a friendly dog. He just dislikes certain people. I haven't the slightest idea why. We used to have a chimp around here named Mildred, whom I have since cut up."

"You cut up Mildred."

"That's correct. I dissected her."

"Do you often cut up animals you know personally?"

He looked annoyed at the suggestion. "Mildred died of natural causes. I saw no sense in wasting the opportunity. Mildred and Killer did not get along. In fact, Killer is responsible for Mildred's death."

"He killed her."

"In a manner of speaking. He treed her and snarled and snapped and gave her a heart attack. Poor old girl. I liked her. Anyway, these two"—he indicated Rodney and

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Boris—"always got along with Killer. Rodney used to ride him like a horse. Boris, who is stronger than Rodney, used to kick Killer around in a friendly sort of way. But *now* watch them."

Dr. Vernon reached over to his desk and pointed to a touchplate with the silhouette of a dog on it. "This symbol means dog. In our case, Killer. Killer is the only dog they've seen." He pointed to a touchplate with an abstract symbol on it and the word "comes." "This means 'comes.' First Rodney."

He set the console for Rodney's cage, then touched "dog" and "comes."

Rodney noticed the lights on his display. He reached over and closed his cage door, glancing apprehensively toward the entrance to the trailer.

"Now Boris."

Identical lights came on in Boris' cage.

Almost instantaneously, Boris began screeching and gibbering, jumping around his cage and quaking with fear. He pushed himself farther into the corner of the cage, curled into a ball and shivered.

Dr. Vernon extinguished the lights, replacing them with "dog" and "goes."

Both animals relaxed.

Dr. Vernon looked at me. "What did you observe?"

"Is this a quiz?"

"Yes."

"Fear, more in Boris than Rodney."

"Very good. Why?"

"Intellectual insight?" I guessed.

"Wrong. They got it from Mildred, Boris more recently than Rodney."

I almost regretted asking my next question. It promised another onslaught of biochemistry. "How?"

Dr. Vernon shook his head, dismayed at his star pupil's failure. "You haven't been paying attention, Penny. Someplace back there, I *told* you *how*, as you put it."

"Tell me again. In simple, straightforward, vivid English."

"First I ground up Mildred's brain. Actually, I put it in something very close to a Waring blender. Then, using the University's molecular synthesizer, I analyzed it. I constructed synthetic RNA based on this analysis, again using the synthesizer. The animals then ingested the synthetic RNA and—"

"How?"

"Pills. I always put things in pill form. Easier to handle. They ingested RNA, reproducing Mildred's DNA, amino acids, et cetera, et cetera, et cetera, in Rodney and Boris' brains. They now know most of what Mildred knew—without lifting a finger to learn it. There is an initial phase of disruption, which they are going through now, followed by a fade-out of maximum effect and a residue of biochemical learning. I an-

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ticipate this procedure will allow people to learn subjects"—he eyed me significantly—"such as chemistry without reading a word—*at*, I might add, about a penny a subject. Thus civilization may proceed whether my students can read or not." He paused, letting me absorb his conclusions. "Was all that in simple, straightforward and vivid enough English for you?"

"Let me ask you something. It may sound stupid, but we've already established I'm a dunce, biochemically speaking."

"There *is* no other way to speak. We *are* our biochemistry. What's your question?"

"When Winslow died, what happened to his body?"

"Chemically?"

"I was thinking more physically. Was he buried, cremated—"

"Dissected."

"Pardon me?"

"He donated his body to the University. To me, actually."

"*You* dissected him?"

"Better a friend than a stranger. I did have help from the medical school."

"And the brain?"

He frowned, annoyed at my squeamishness. "Yes, yes, yes. I had it analyzed and RNA synthesized. I saw no sense in wasting the opportunity. I even discussed it with Winslow after his first heart attack. There was no suitable heart donor available and he was allergic to the plastic they use in artificial hearts. He knew he was going to die. He approved completely. Why wouldn't he? His own operation proved the potential of the technique. I only wish I had had him there to perform the autopsy. He was a brilliant surgeon, Penny, brilliant. Skills like that are hard to find. Any help I can give future medical students will benefit society far beyond anything imagined by the myopic money-grubbers who hounded Winslow to his grave."

"Have you, eh, used it on human beings?"

"Don't be silly, Penny. *Much* too early for that, except in special cases like that patient of Winslow's. *Tests*, I have to do more *tests* before we can even think of it. I just took advantage—*with* Winslow's approval, I repeat—of an opportunity. Maybe someday—" He made large canceling sweeps of both hands. "Forget it, forget it. Couldn't do it if I wanted to, not without running everything through the synthesizer again. I don't even have the damn RNA anymore."

"Rodney ate it."

"No. That damn *Pierce* of yours *stole* it."

By the time I left Dr. Vernon's trailer, it had started to rain. I hurried across campus to my car, my coat collar up, wondering if the University's great minds had ever solved the problem of whether you get wetter running or walking in rain.

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I started back to my office, trying to dissect what Dr. Vernon had told me. The static wipers repelled most of the rain, though I could hear the low hum of the static generator under the dashboard. I might need spare parts yet.

The whole picture had become so complicated it reminded me of one of those Tinker Toy models of a giant molecule, little things sticking out everywhere, seemingly chaotic, but all attached to something in the middle—namely, Winslow. Thinking about the complicated structure of events proved too much work. I turned on some music--Harvey Highwire, as it turned out—and tried to wipe my mind clean, letting the facts seep into my unconscious. After all, I feed it. It can work for its living.

Crossing the short bridge onto Balboa Island, listening to Harvey hit a warbling high "C," my unconscious paid its freight, coughing up an insight. Contrary to what I had been led to expect, the insight failed to strike fear into my heart. It did—immediately and compellingly—demand my attention.

I jammed on the brakes, skidding slightly on the wet pavement. I shut off Harvey. I sat, staring down Marine Avenue, watching the rain and pondering, fixing the insight before my mind's eye until I understood it completely.

I smiled, shaking my head in disbelief. "No, it can't be."

Gradually, when I had thoroughly examined my insight, I became aware of the glassy street in front of me, the sound of the rain on the roof and car horns behind me.

"OK, OK. I'm moving."

I finished crossing the bridge and turned in behind my office.

The girls were grouped near the back door, putting on coats and preparing to brave the rain.

"Bud come back?"

"No, Mr. Penny."

I went into my office and got on the phone. Pierce's number rang a long time. Finally, he answered, looking like a man who had just dug a bullet out of his own leg with a pocket knife.

"What's the matter with you?"

"It's a headache, Mr. Penny. I'll be all right."

I told him what I had done so far. He had difficulty concentrating on it. He kept asking me to repeat things, trying to listen, then becoming lost in his pain. When I got to the part about a possible deal with the Deputy District Attorney, he made innocent man protestations. Instead of giving him the hard sell on six months being better than ten years, I went on to Winslow.

"Pierce, listen to me."

Clenching his teeth, his jaw muscles standing out, he tried to listen. He kept covering his eyes with his hand and rubbing his temples.

"Pierce, damn it, this is important."

"I can hear you, but the pain—"

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"Cope with it. When you stole that bottle from Dr. Vernon–"

The pain had made him irritable. "I didn't *steal* anything. How many times do I have to tell you that. I just took what I needed."

"My junkie clients say the same thing. When you took it, how did you know you had the right bottle?"

"Dr. Winslow showed me the bottle. Dr. Vernon has a code system. It's like the periodic table with blank spaces in it for new material. Dr. Winslow showed me enough of the code system so I could get what I needed if anything happened to him. I think he expected the second heart attack and wanted to take care of me."

"Did you ever try to get any of the pills before Winslow died?"

He rubbed his temples. "This headache's killing me, Mr. Penny. Couldn't we postpone this until–"

"No. Did you?"

"I looked once or twice. It was never there."

"Only *after* Winslow died?"

"That's right. Is that important?"

"OK, here's what I want you to do. You have to do it now, headache or no headache. Promise me you'll do it as soon as you hang up. It's going to sound like I'm nuts, but I mean it. You'll have to trust me completely. What I'm going to ask you to do will keep you from being brought up on murder charges."

That got his attention. His hand dropped away from his forehead. He looked at me, unsure whether he had heard the word correctly. "Did you just say–"

"Murder. I don't know how you're going to do it, but if you don't follow my instructions, you will."

He spoke slowly, inquiringly. "Who will I–"

"Morrow. You wouldn't want to murder anyone who had ruined his partner's career, taken his partner's medical practice and probably his wife, would you?"

"No, but–"

"Good. Glad to hear it. Who's the toughest guy around that student housing, the biggest, the strongest, the meanest?"

He looked at me, beginning to suspect he had hired a crazy lawyer. "There's Jimmy Williams."

"Can he take you?"

"I guess so. He's defensive tackle for the Anteaters. I'd hate to try him."

"Is he around now?"

"Probably. He studies all the time."

"Good. Go get him. Bring him and his books back to your room. Tell him you've been taking dope. Tell him–"

"But I *haven't!*"

"*I know*, but tell him that. Tell him you want to kick the habit cold turkey. Give him twenty bucks–do you have twenty bucks?"

His suspicions about his lawyer deepened. "Yes."

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"Give him the twenty bucks and tell him to kick the shit out of you if you try to leave the room. Got it?"

"Mr. *Penny*–"

"Got it?"

"Yes, but–"

"*Do* it. Do it now. They do not let you out of the joint with very many years of life left when you commit murder. I'll be there as soon as I can."

He sat a moment, trying to collect his thoughts and fight his headache.

"*PIERCE! DO it!*"

I hung up and walked into the hall, starting for the back door. I paused long enough to jot a note to my partner.

Bud,

I got a hell of a story to tell you if you ever get finished screwing around with Mrs. Whatever-her-name-is-this-time and show up for work.

HP

Going up MacArthur, the rain let loose. It came down so hard I had to supplement the static wiper with the floppy rubber ones. I kept going over the whole thing in my mind, hoping to find some flaw in it. None appeared. Winslow had seen his own death coming. He hated Morrow because of a ruined career and a ruined life. He knew Dr. Vernon's research and its implications better than Dr. Vernon. He decided to stand *Hamlet* on its head. Instead of a man being the instrument of a ghost's revenge, a ghost–or something like it–would be the instrument of a man's revenge.

Pierce–probably from studying too hard or not having a regular girlfriend–got headaches, natural headaches. Because of them, Winslow got an idea. He began treating Pierce with something to give him excruciating headaches, at the same time telling him it would cure the headaches.

Pierce, a grad student in biochemistry with just enough knowledge to appreciate Winslow's brilliance without actually being able to understand what was happening, believed Winslow unquestioningly. Winslow showed him Dr. Vernon's chemical coding system, knowing the code Dr. Vernon would use for his own synthetic RNA when it was processed. At that point, Winslow died. Pierce stole the RNA, took it and assaulted–probably intending to murder–Dr. Morrow.

Why so elaborate and chancy a chain of circumstances, especially from a man about to die anyway, a man without hope? Hell if I knew. If I had hated Morrow that much, I would have just walked in and blown the bastard's brains out with a .45. But I am a simple, direct person.

I parked on the street in front of the modular housing glob. I started toward the cluster at a jog, almost slipping once on the wet concrete.

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After trotting upstairs and along balcony walkways and around irregular corners, I found Pierce's apartment.

Catching my breath, I knocked.

Either my mind was working fast, making the interval between knock and answer seem too long, or it was too long. I started to pound on the door.

It opened a crack.

A voice, deep and possibly black, said, "Who's-air?"

"Penny."

The door came open. I looked up at a very tough face, big, mean, strong and black—especially mean.

"What you want?"

"To see Pierce."

"You the guy that—"

"I'm the guy."

He dropped the intimidating air, along with the street accent and opened the door. "He's in here."

"Did he cause any trouble?"

"No."

"Did he try to leave?"

"Once."

I followed him into the bedroom. Pierce was sprawled back across the bed, his cheek cut, his eye blackening, unconscious.

Williams looked at him, deadpan. "I think he'll have a headache when he wakes up."

I gave Williams a ten for a bonus and asked him to wait in the living room, adding, "but don't leave. You're better at this than I am."

He looked deadpan again, said "yep," and went into the living room.

I got a wet washcloth from the bathroom and put it across Pierce's forehead. He revived slowly, pushing himself up on his elbows, shaking his head. The washcloth fell off. He gave his eyes an exaggerated blink. Eventually, he focused on me.

"Who are you?" The voice sounded older, more assured than Pierce's.

"Penny. I'm Pierce's lawyer."

He absorbed that, shook his head again to clear it and sat up. He looked either more intelligent or more experienced than Pierce. Even fresh from Williams' pate-addling, he put things together quickly.

"You know, don't you?"

I nodded. "Most of it. Tell me the rest."

He looked around the room.

I indicated the door to the living room. "He's in there. You're not going anyplace."

He slumped back onto his elbows, looking at me. "Do I know you?"

"Of me. You may have seen my picture. I dated Nora before she married the first time."

His face hardened a moment at the mention of Nora's name. "Have you seen her?"

"Today."

"How is she?"

"Still wearing her green eyeshade

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and separating the fives from the tens."

He smiled faintly. "She wasn't like that when I married her."

"She was like that when you married her."

He started to say something.

"Take my word for it."

"*He* made her think that way."

"She thought that way from the day she was born. Tell me something, was the operation on the little girl necessary?"

His eyes flashed hatred at me. "Have you *talked* to that little girl?"

"No."

"She's twelve now. She's a perfectly normal little girl."

"Was it necessary?"

He started to speak, broke off and shook his head, dropping his face to his hands and rubbing his temples. "I don't know anymore. I thought so at the time. Now I—there's so many things I forget now."

"Like Pierce, a friend of yours you're going to wind up putting in jail for murder."

He looked at me, resolution returning to his face. "I'm sorry about Marshal, but there wasn't any other way."

I gave him my suggestion about the .45.

"And what would that have proved?"

"What does *this* prove?"

"That Vernon's technique is valid, that its possibilities—here and now—go far beyond anything the great Fourteenth Century minds in the medical establishment could dream. The publicity alone will spark new investigations of the technique's potential."

"The publicity would have all been about some madman graduate student who killed a stranger."

"I wrote it all out." He nodded toward a desk across the room. "It's in the bottom drawer. The police would have found it."

"And disregarded it as more ravings of the madman grad student."

He looked at me, a new intensity in his eyes. "Maybe. Maybe not. I know one thing for sure. At least that son-of-a-bitch Morrow would have been dead." He gazed past me, talking, rekindling his hatred. "He took everything I had, Penny. He instigated the medical examiner's hearing. He convinced them to revoke my license. Because of the scandal, he bought out my share of the practice at a fraction of what it was worth. Then Nora—he worked on Nora until she left me."

"I don't think it took much work."

"And then he had the *gall* to start coming around Vernon's trailers asking about the technique. He had taken everything else and now he wanted the one thing I had left. He kept asking about its potential applications, what it could do. Vernon refused to talk to him. I just about got in a fight with him. I de-

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cided I would show him what it could do. I hated him, Penny. I hated him more than I have ever hated anything in my life."

"Are you sure?"

He looked at me, expression blank. "What do you mean?"

"What color are Nora's eyes?"

"Blue. Why?"

"They're brown."

"You're wrong, they're—"

"Brown. I just saw them this morning. Is anything else different? Do you get people's names confused? What about chemistry. Do you remember what phosphorylation means?"

"Yes, it's—" He hesitated, thinking. "I know what it means."

"What?"

"Look, I don't have to put up with this. I know what you're trying to say. I've been over the same arguments a hundred times. If I don't remember the exact color of Nora's eyes—"

"You weren't even close."

"If I don't remember some obscure chemical process—"

"One you dealt with every day working for Dr. Vernon, one Pierce said you knew more about than Dr. Vernon himself."

"You're trying to say I'm not the same person."

"No, I'm trying to say maybe Raymond Winslow didn't hate Morrow as much as you say. Maybe Winslow did perform an unnecessary operation just to try his new technique. The brilliant surgeon, the new technique, the triumphant success—Winslow might have thought no one would notice in the hoopla over his grand achievement. I'm saying maybe he felt guilty about that, *very* guilty, and guilt let him do something or say something so Morrow would find out and punish him. If you can't remember things exactly, how do you know it didn't happen that way?"

Throughout this speech, he had grown more and more angry. By the time I came to the end, he was glaring at me. "Penny, I know one thing. It's the only thing I have to know. Even if that *other* Ray Winslow felt guilt, I don't. Even if *he* wanted to be punished, I don't. I feel hate." He tapped his chest with his thumb. "*I* hate Morrow. I don't need anything else. Besides, if what you say is true—and I *know* it isn't—"

"How?"

"Intuitively."

"That and fifty cents will get you a cup of—"

"*Even* if it were true, why would this other Winslow produce"—he tapped his chest again—"me?"

"I just told you, guilt, punishment."

"*Puni*shment! Haven't I suffered enough already? Good *God,* man, I've lost everything!"

"It's never enough. Personalities like that get punished and it's not enough. It's not enough because they don't want to be punished and

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forgiven. They just want to be punished and punished and punished. Half my clients are that way, habitual criminals—no, I take that back. Habitual prisoners. They want to be punished. They're so guilt-ridden I'm surprised they can function at all. But they can. As long as they get their reward of punishment, they can. They're like Dr. Vernon's mice or his monkeys, only instead of candy, they get a kick in the teeth. They like it. They thrive on it. They come back for more—any way they can."

"You think I did this out of *guilt*, so I could be punished some more?" He laughed, a bitter and ironic laugh.

"I'm suggesting maybe *he* did it out of guilt, Winslow. How many times had he performed needless operations to test his brilliant new techniques? The medical board seemed very interested in all those other innovations. How many times? Do you know, for sure? Maybe it's guilt fueling your hate and a molecule got lost someplace so only the hate's left."

"Penny—"

"What color are Nora's eyes?"

His head dropped to his hands again. He shook it. "I don't know. I don't know anymore. All I know is how I feel. I hate him, Penny. He took everything and I hate him."

"And if you're wrong?"

He looked at me. "What do you believe?"

"It's more important what you believe."

He looked bewildered, genuinely confused. "What am I supposed to do about it?"

"Let it go."

"Let it *go*. How can I just—"

"Pierce said Winslow was a good man."

I watched him. Emotional and physical pain distorted his face. His expression was almost pleading, as though he wanted my approval or permission. I just watched, trying not to let anything I felt show in my face.

Finally, he turned to the wall and pounded his fist on it, speaking with each blow. *"Damn! Damn! Damn!"*

He fell across the bed and turned away from me. I sat there, quietly, waiting. Williams stuck his head in, looked toward the bed, then at me.

I nodded and waved him back into the other room.

After about twenty minutes, Pierce's body seemed to relax. It stayed relaxed a few more minutes, then stirred. He rolled away from the wall and lifted his head, squinting at me.

"Mr. Penny, what—" He became aware of the cut on his cheek, touched it, winced and looked at me.

"You tried to leave."

I told him, briefly, what I knew. He listened, progressively more incredulous. When I finished, he left the bed and went to his desk, get-

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ting out Winslow's explanation. He read it twice, slowly, then handed it to me.

"How long did this . . . episode last?"

"Half hour. Maybe a little more."

"Shorter."

I remembered the bell-shaped curve on Dr. Vernon's chart, the steep slope once the fadeout had begun. "It will probably be shorter next time." I got up and started for the door.

"Mr. Penny."

"What?"

"What was Dr. Winslow like?"

I thought a moment, looking for the best answer. "I don't know, Pierce. I never met the man."

Over the next week, Williams stayed with Pierce. The headaches became less severe. The blackouts shortened in duration. Eventually, both disappeared.

I made one more visit to Dr. Morrow. I explained the situation as well as I could and showed him Winslow's written explanation. I asked him to drop the charges against Pierce. He was familiar enough with Dr. Vernon's techniques to be convinced. He agreed.

The moment he agreed, I felt an odd sensation, regret. The case would never get to trial. I would never have to convince a court or a jury of what I had told Morrow. Too bad. I would have enjoyed stuffing the whole thing down Deputy District Attorney Fountain's throat.

Morrow walked me out of his office and down the hall toward his receptionist.

"Tell me, Harry, all those things Winslow . . ."

"Or whoever."

". . . said about me, that I deliberately set out to wreck his career for money, do you believe them?"

We stopped by the receptionist's desk. I glanced at her. She had on an extremely short uniform with a long expanse of tan leg showing. I kept looking at her. "Money? Who knows? There are all sorts of reasons for doing things." I looked at him. "Sometimes the man just wants a woman and the woman wants the money. Hard to say. Me, I try not to believe anyone. It simplifies my life." ■

● **IN TIMES TO COME** L. Sprague de Camp's fame as a fiction writer sometimes overshadows his equally brilliant talents in writing nonfiction. Next month's issue features a science fact article by de Camp, "The Breeds of Man," which deals with eugenics and the future of human racial characteristics. Some of the findings and extrapolations will surprise you. Mike Hinge has painted his first cover illustration for this article; it is a "different" kind of cover, and the Editor would appreciate your reactions.

We will also have a story by Hayford Peirce, the conclusion of "Children of Dune," and all our regular features—including Lester del Rey's "Reference Library" which regrettably had to be omitted this month for lack of space.

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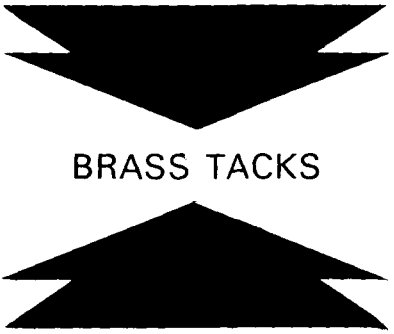

Dear Mr. Bova:

At the end of James Oberg's article "The Legacy of Apollo-Soyuz" (August 1975 issue) he writes about the Mars probe: "The whole Earth had sent him."

That is not impression one gets from the science fiction/science fact combination in the article. Mr. Oberg talks about Soviet-American cooperation slowly spreading via the shuttle program to Europe and Japan. He seems to have forgotten the old journalism adage about "first getting it right" before writing. He completely ignored the oldest example of international space cooperation, cooperation between the United States and Canada.

Canada-US cooperation began in September 1962 with the launch of the ionospheric research satellite Alouette I, which has been described as a get-to-know-each-other mission between Canada and NASA. That cooperation continued in the International Satellites for Ionospheric Studies program.

The auroral oval over Hudson Bay provided an opportunity for upper atmosphere research and there were launches by the US Army from the Churchill Research Range in 1956.

Since that time there have been many upper atmosphere sounding launches of the Canadian built Black Brant rockets. The project was a joint Canada-NASA effort in the Sixties and is now under Canadian control. As well as launching rockets for NASA, Canada has launched rockets for Japan, Australia, Britain, Belgium and in one of the earliest examples of East-West cooperation, Czechoslovakia.

Canadian industry was involved in the Apollo programs through subcontracts and there is a ground station in Newfoundland used in the Apollo and Apollo-Soyuz missions.

A current joint US-Canadian program is the Communications Technology Satellite, one of the first direct broadcast satellites. The project follows the traditional NASA-Canada arrangement where no funds cross the border. The satellite is designed and built in Canada and the ground control station will be at the Communications Research Center at Shirley Bay near Ottawa. NASA supplies some hardware testing support and will launch the CTS. The experiments are shared between Canada and the US with three others going to Europe . . .

Mr. Oberg's fictional Kosmos hardware exchange has been beaten by the Canadians. In an example of three-way, Canadian-French-Soviet cooperation, the French placed an experiment, Stereo 5, on the Mars 6 and 7

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probes launched in August 1973. Canadian-built STEM (Storable Tubular Extendable Member) antennas were part of the Stereo package which studied solar emissions during the coast phase of the Soviet Mars mission.

Canadian-built hardware has also been on board British, French, German and Japanese satellites.

Canada has also developed systems to help solve its own problems, such as the LANDSAT (formerly ERTS) "Quick-Look" Facility which provides sea captains with information on arctic ice conditions, monitors forest fires and aids in scientific study.

Since I favor continued space exploration and since international cooperation is the only way to do it, both to save money and to use the talents available, I deplore articles such as Mr. Oberg's which leave the impression, perhaps subconsciously, that only the rich superpowers count. One of the reasons the United States is losing the support of its friends and allies in the United Nations and elsewhere is that US policy has ignored their needs and aspirations in the belief that US policy-makers know best. It's not so, and let's take as little of that groundhog stupidity into space as we can.

ROBIN FREDERIC ROWLAND
256 Snowdon Avenue
Toronto, Ontario
Canada M3N 2B3

And let's also recognize that without the Russian and US space programs, there'd be no space efforts in Canada or anywhere else.

Dear Ben:

Lord St. Davids' story, "In the High Court of Justice," in the October 1975 Analog is an invitation for arguments to the contrary. Could you persuade Larry Niven and/or Jerry Pournelle to take up the gauntlet in story form? Lord St. Davids' argument is logical, but his court's decision is one only a computer could love. Assuming that a lot of people have gone through the matter transmitter, I think that the decision that they are all legally dead must necessarily be reversed on appeal to the House of Lords, or by legislation in the House of Commons. It just is not reasonable to treat a large group of live people as having lost their families, property, jobs, degrees, licenses, and citizenship merely because of the method they chose to commute to work. They are, after all, indistinguishable from the originals—fingerprints, voiceprints, retinal patterns, job skills, even their clothing and identification cards are there to identify them as the people they claim to be. Why shouldn't society accept the transmittee as the person who left home that morning and is returning that evening, subject to the usual means of identification?

The duplicate reception problem does not require the result reached in the story. First, nobody ever was duplicated, so the problem is hypothetical. Considering the energy required to reconstruct an 85 kgm adult, I doubt that anyone could be duplicated without beaming to the receiver the energy derived at the transmitter by destroying the original being transmitted. The courts

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just aren't going to worry about a hypothetical problem when faced with a pressing real problem—the rights of the people in the lawsuit. But for the sake of argument, let's suppose we have unlimited fusion power to reconstruct duplicate transmittees, and someone actually comes out of a receiver twice. There are several legal possibilities. One is to say that one of the duplicates is the transmittee and that the other belongs to the transmit company, which is entitled to recover its energy by popping the duplicate back in the machine. I guess that it would be a random selection—they'd grab the first one they could catch.

This not likely to be an acceptable solution.

The most likely solution is to hold the transmit company strictly liable at law for the duplication, just as it is strictly liable for injuring a transmittee in transit under the law covering common carriers. The company would have a legal duty to compensate any duplicate transmittee(s) for their financial losses incurred picking up the pieces of the confused personal and financial tangle created by the company's negligence in creating duplicates.

This would leave some things that would be difficult: marriage and other family connections, ownership of property, partnership rights, and employment rights are obviously going to be very difficult to sort out. But this is no reason why the duplicates should not retain university degrees, professional licenses, and other things that recognize competence or achievement. Each duplicate retains that by definition. These, with the financial settlement from the transmit company, would permit the duplicates to function as useful members of society.

Of course, the discussion above is based on a need to deal with the claims of a large number of people who have gone through a matter transmitter . . . Lord St. Davids is correct—anyone who submits to travel by means of a destruct-and-reconstruct system dies. If the body is converted from mass to emergy, its structure ceases to exist, which is a pretty good definition of death . . .

Basically, a destruct-and-reconstruct system is not really a matter transmitter. If you have the energy to reconstruct items economically from an original to be copied, you have a new industrial revolution. It would allow perfect duplication of technical equipment without worrying about tolerances and variations. And it would eliminate the production line factory, with all its technical and social implications.

JOHN T. SAPIENZA, JR.
2440 Virginia Avenue, NW
Washington, DC 20037

George O. Smith dealt with that "new industrial revolution" some years ago, in "Venus Equilateral." But the real point of Lord St. Davids' piece is that you really do die when you step into a transmitter booth (as they are currently envisioned by Niven, et al.). That duplicate stepping out of the receiving booth is not you. What would the

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insurance companies say about such a suicide?

Dear Ben:

Jim Goldfrank's memoir on Will Jenkins in the October issue is quite moving but your introduction has picked up verbatim the *New York Times* obituary error on Mr. Jenkins' age; he did not die at 73 but at 79 . . . both Tuck's *Encyclopedia* and Reginald's *Contemporary S-F Authors* give his birthdate as 6/16/96.

I am sure that this is correct and the *Times* in error since Mr. Jenkins would have sold his first story to *Argosy* at seventeen rather than the more reasonable twenty-three if the *Times* were correct.

I hope that this does not sound stuffy of me, my request for accuracy that is, but have a feeling that Mr. Jenkins (who, alas, I never met) would be on my side. In the first place we were all granted six more years of him than the *Times* credits and in the second place if one cannot get obituary accuracy in the market which was closest to us and most identified with our work for so many years, where *could* we get it?

BARRY MALZBERG

Sorry for the error.

GUEST EDITORIAL *continued from page 10*

decades. It's when these stuck regions suddenly jerk forward to release built-up strain that earthquakes occur—and the longer the period without movement, the bigger the jerk when it does come.

The full story of all this takes up about a third of our book (now available in paperback at a very modest price), but I hope this thumbnail sketch is enough to make the next step sound plausible. In essence, this is the "last straw" argument. When strain has built up in a region of Fault that has temporarily become locked solid, some outside influence might well provide the kick which triggers it into motion. On a small scale, the last straw might be the passage of a truck shaking a region of Fault that has been stuck for a week or so. That would allow a sudden slip of perhaps one millimeter, the kind of earthquake which bothers no one. But suppose a large section of Fault has been locked for a hundred years. Clearly, it's got to go sometime, and it's more likely to move—by a cool 60 meters or more—when some outside nudge pushes it over the top.

That's the situation in the southern part of the San Andreas Fault today. Since the great earthquake of 1857 a stretch of Fault hundreds of kilometers long (roughly from San Bernardino just east of Los An-

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geles to Cholame, just south of Parkfield) has been relatively calm. Further north, along a stretch from San Francisco north to Cape Mendocino is another region of Fault that is quiet today. This is the region affected by the 1906 quake. And in between we find a stretch of Fault which is more or less permanently in motion, subject to small quakes and creep.

Paradoxically, the regions where no movement occurs today are those most at risk. Continuous creep continuously releases the strain. But north of San Francisco there is 70 years of accumulated strain, sitting like a time bomb under the feet of the inhabitants. And in the southern part of the Fault there is a similar time bomb holding energy equivalent to 120 years of normal slippage.

There's a lot more evidence than these "common sense" arguments and this evidence all points to the same conclusion. Either of the stretches of Fault which are now quiet could move dramatically at any time; and the southern part of the Fault, in particular, seems to be overdue for a major quake.

But there's the snag—the Fault could move at *any* time. So is there any time at which the chance of this happening must be much greater than average?

This brings us back to the interaction of solar activity with the spinning Earth. Think of the Earth as a spinning top, covered by a loose-fitting spheroidal jigsaw puzzle of tectonic plates. If you kick the spinning top and change the spin, even by a small amount, the jigsaw pieces are going to be shaken up. In tectonic terms, regions of instability along plate boundaries will be triggered into activity.

That includes such places as Alaska, the Middle East and Japan, to name but three. In most parts of the seismically active regions of the globe, however, small-scale activity is repeatedly releasing energy. So even a sudden shake won't release a great deal more energy than usual—there just isn't a great deal of built-up strain. The only place in the world where we find dense centers of population and industry sitting on top of seismically active regions in which strain has been building up for decades is California.

That, of course, is a story in itself. You don't need to be a wizard at predicting earthquakes to know that it's just damn silly to build in either San Francisco or Los Angeles. They are both going to go sometime, and it's a significant (if sad) reflection on human nature that the inhabitants ignore this, with a basic attitude that with any luck it will be the other guy who suffers when the inevitable occurs.

Leaving human nature aside, that is why we picked Los Angeles for our study. Of course, we've been accused of sensationalism in suggesting that LA is in for a big quake. If we'd specified Alaska, say, as the site of the next big one then our book would have got much less attention. But it cuts both ways; if the theory pinpointed Alaska as the likely site, there wouldn't have been much point in

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making a fuss about it, since few people would be affected. And the geophysical facts are indisputable. Perhaps as much as 75 meters of overdue movement is waiting to jerk the southern part of the San Andreas.

So we are looking for something outside the Earth that can give a kick to the whole spinning globe. The obvious place to look is at the Sun, and immediately you hit the jackpot. The spin of the Earth changes over many timescales, by a few thousandths of a second added to or subtracted from the length of the day. Hardly enough to necessitate resetting your watch, but enough to be significant in terms of seismic activity.

One of the regular changes in length of day is caused by the movements of air masses and changes in the overall circulation of the atmosphere with the seasons. The atmosphere doesn't have a lot of mass compared with the solid Earth, but it is right on the outside. Just as the position of the arms plays a big part in affecting the spin rate of an ice skater, so movements of the atmosphere, out where a little mass can have a lot of angular momentum, can affect the spin of the whole Earth.

As for the energy involved in these kinds of changes, among many regular or periodic changes in the behavior of our spinning-top home is one called the Chandler Wobble, in which the orientation of the spin axis (or pole) shifts with a period of about fourteen months. The cause of this wobble is still a mystery. But the energy associated with it is very similar to the amount of energy being released over the same period in earthquakes. Do earthquakes cause the wobble? Or, on the other hand, does the wobble trigger regions of seismic instability into life? No one knows. But the important point is that changes in the energy balance of seismic events are indeed comparable to the energy related to changes in the Earth's rotation.

On a smaller scale than the Chandler Wobble, the Earth's spin does seem to be affected by changes in the Sun's activity, over the solar cycle of activity. This might have seemed a real mystery even a few years ago, but space exploration has shown just how much the regions around the Sun, and not just the Sun itself, are affected by changes in solar activity.

The visible sunspots are just one symptom of changes which affect the output of energetic solar cosmic rays (the solar wind) and the structure of the solar magnetic field, which stretches out across the Solar System in a spiral pattern. I don't believe that the solar-terrestrial link involves magnetism (for reasons we discuss in our book), but it does seem likely that changes in the output of solar particles affect the atmospheric circulation.

Once again, that's a whole story in itself (see my next book!). But it seems that the particles from the Sun are focused by the Earth's magnetic field (since, of course, they are electrically-charged particles) onto regions near the poles. And those regions are key points in the atmospheric circulation, where

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a small change can build up to affect the whole pattern over a hemisphere. We already know that seasonal changes in circulation affect the Earth's spin. It seems hard to escape the conclusion that it is a similar effect which explains the otherwise baffling observational fact that changes in the Earth's spin occur at times of maximum solar activity.

So there you are. Leaving out the contentious possibility of a planetary influence on sunspots, we are at the end of the chain. At peak solar activity, the Earth is shaken up (by a seemingly trifling amount in astronomical terms) by the effect of streams of charged particles from the Sun on the atmosphere. That shaking is going to set off any region of tectonic activity that only needs a small nudge to be triggered into life. And one region that has been ominously quiet for a long time is the southern part of the San Andreas.

The key question remains: Is that part of the San Andreas so close to moving that the admittedly small extra nudge due at the time of next solar maximum will trigger it into life? I think it may well be in such a state—indeed, from the geophysical evidence there is a distinct chance that the Fault will move even sooner, without any additional nudge. In the late 1950s, when the Sun was unusually active even by the standards of normal sunspot maxima, the LA part of the San Andreas had "only" gone 100 years without moving. It would have been no great surprise if the solar influence in the late 1960s had set the time bomb off, although that solar peak was rather less than the height reached in the '50s. But by the end of the 1970s or early 1980s we are considering a situation in which another quarter-century of strain has accumulated since the 1950s.

As a rule of thumb, it was 100 years before the 1906 quake that the previous comparable event in the northern region of the Fault took place. That's not much of a guide on which to base a guess that the southern part "ought" to move not too long after 100 years have elapsed since the 1857 event. But the geological evidence from studies of the behavior of rock under strain also points to much the same conclusion.

The whole idea can be summed up in two sentences. Sunspots affect atmosphere affects spin. Parts of the San Andreas are in an unusual state of strain, so look out for something around the time of the next solar maximum.

It must be one of the rarer occurrences in science for the proponents of an idea (hypothesis, theory or whatever) to hope as fervently as we do that we will be proved wrong. We certainly may be wrong—in science, it's generally only crackpots who claim to be infallible—and if we are wrong LA may have a few more years of breathing space (assuming the smog doesn't get them first). Right or wrong on this idea, however, the people of Los Angeles are still dicing with death. Something is going to set that Fault off soon, even if the sunspots don't. ■

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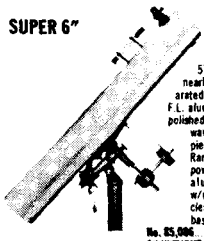

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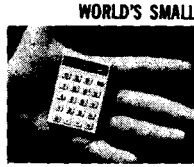

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First World Hydrogen Energy Conference (IAHE) at Miami, Florida. Info: International Association for Hydrogen Energy, Post Office Box 248294, Coral Gables, Florida 33124.

March 12-14, 1976:
LEPRECON 2 (Phoenix area SF Conference) at Phoenix, Arizona. Guest of Honor: Roger Zelazny; Toastmaster: F.M. Busby. Registration: $4 in advance, $5 at the door. Info: Box 1749, Phoenix, Arizona 85001.

March 19-21, 1976:
MARCON 11 (Columbus, Ohio area SF Conference) at the Neil House Motor Hotel. Guest of Honor: Joe Haldeman. Info: Larry Smith, 194 East Tulane, Columbus, Ohio 43202.

March 26-28, 1976:
AGGIECON 7 (SF Conference in Texas A&M area). Guest of Honor: Anne McCaffrey. Info: John Roark, Post Office Box 4924, College Station, Texas 77844.

March 31, 1976:
Interstellar Travel and Communication Conference at University College, London, England. Info: British Interplanetary Society, 12, Bessborough Gardens, London SW1V 2JJ, England.

September 2-6, 1976:
MIDAMERICON (34th World Science Fiction Convention) at Hotel Muehlbach, Kansas City, Missouri. Guest of Honor: Robert A. Heinlein; Fan Guest of Honor: George Barr; Toastmaster: Bob Tucker. Panels, talks, masquerade, films; presentation of the Hugos and the John W. Campbell Award for Best New Writer. Registration: $20 attending (until 1 May), $6 nonattending. The committee is handling all room reservations so don't write directly to the hotel. Info: Post Office Box 221, Kansas City, Missouri 64141.

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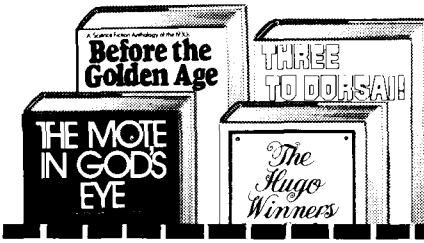

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